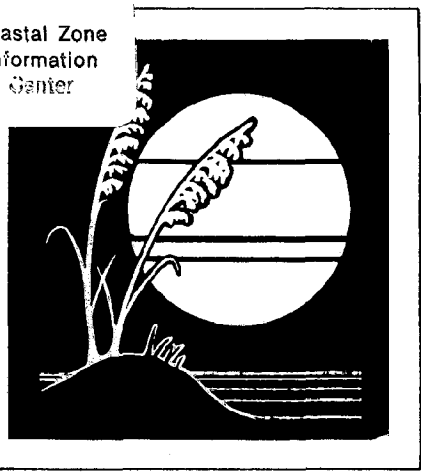

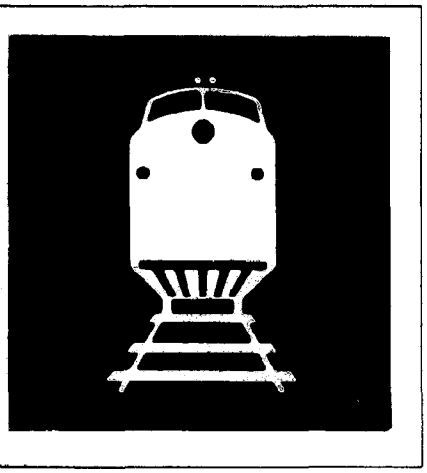

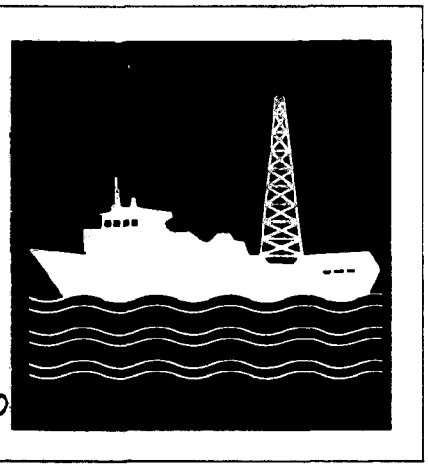

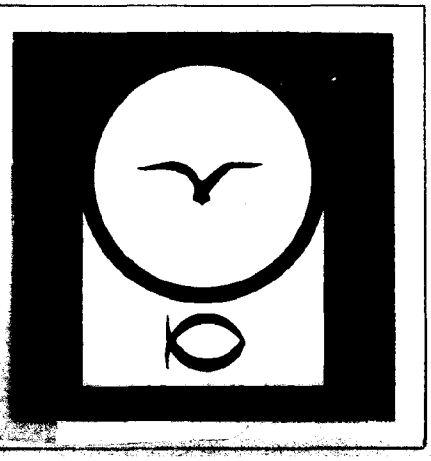

Natural Areas Inventory
of
Carteret County, North Carolina

COASTAL ZONE

INFORMATION CENTER

John O. Fussell III
Morehead City, N.C.
Jeannie Wilson
Hampton Mariners Museum
Beaufort, N.C.

JUNE 1983

North Carolina
Coastal Energy Impact Program
Office of Coastal Management
North Carolina Department of Natural Resources
and Community Development

CEIP REPORT NO. 9

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NATURAL AREAS INVENTORY OF CARTERET COUNTY, NORTH CAROLINA

for

The North Carolina Natural
Heritage Program
Coastal Natural Area Inventory Project

by

John O. Fussell III[1]

and

Jeannie Wilson[2]

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June 1983

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PREFACE

The North Carolina Office of Coastal Management and the North Carolina Natural Heritage Program, both units of the Department of Natural Resources and Community Development, have commissioned a series of natural areas inventories for ten counties in the coastal zone of this state. The Carteret County inventory was conducted in 1980 and was financed by a Coastal Energy Impact Program (CEIP) grant. CEIP funded the Carteret County survey because of the potential environmental impacts of peat mining and other energy-related development.

The recommendations in this report by John Fussell and Jeannie Wilson are advisory. Their inventory and recommendations are designed to help state and federal agencies, county officials, resource managers, landowners and developers work out effective land management and preservation mechanisms to protect the outstanding or exemplary natural areas described in this report. Agencies such as the N.C. Division of Environmental Management, Division of Land Resources, Division of Marine Fisheries, Wildlife Resources Commission, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, National Marine Fisheries Service, and Environmental Protection Agency should find this report useful, as may university researchers, private consultants, and private conservation groups. The Office of Coastal Management will use the report in assessing permit applications and for federal and state consistency reviews.

Jeannie Wilson and John Fussell are experienced field biologists, with intimate familiarity with the ecological resources of the project region. The investigators were exceptionally well qualified to identify, describe, and evaluate the most outstanding natural areas of the project region.

Project investigators were instructed to identify natural areas that contain highly unique, endangered, or rare natural features, or high-quality representations of relatively undisturbed natural habitats, and which may be vulnerable to threats and damage from land use changes. Consequently, the investigators were advised not to report extensively on the large expanses of brackish and salt marshes, that fringe most of the county's shoreline, and which, for the most part, are ecosystems protected through state and federal regulatory programs. The investigators did not report on the barrier islands composing Cape Lookout National Seashore (Core, Portsmouth, and Shackelford islands).

Carteret County possesses extraordinary natural diversity. The original document compiled by Fussell and Wilson contained reports on 23 natural areas. It has been necessary to reduce that number to those areas considered to possess ecological resources of national, statewide, or regional significance. Descriptions for other sites of local interest are obtainable from the Natural Heritage Program.

National and Statewide Significance (High)

Carrot Island - Bird Shoals
Cedar Island Refuge Natural Area
Core Banks and Portsmouth Island
Shackleford Banks
Croatan Pocosins
Millis Road Savanna and Swales with Pocosins
Patsy Pond Complex
Roosevelt Natural Area
Bogue Inlet Heronry
Core Sound (Wainwright) Nesting Islands
Dump Island Nesting Colony
Morgan Island Nesting Colony
Phillips and Annex Islands Nesting Colonies

Regional Significance (Medium)

Atlantic Natural Area
Browns Island
Emerald Island Woods
Hadnot Creek Natural Area
Hadnot Creek Ponds and Longleaf Woods
Masontown Pocosin
North River Marshes
Pringle Road Carolina Bays
Sea Gate Woods
Union Point Pocosin
Walkers Millpond Area
Wildberry Woods
White Oak River - Cedar Point Marshes

The Office of Coastal Management, and the Coastal Resources Commission which it serves, implement the Coastal Area Management Act of 1974 (CAMA). Under this statute, the North Carolina Coastal Management Plan has been prepared and approved. It includes the definition and designation of various Areas of Environmental Concern (AEC). In some cases, AECs coincide with natural areas that are herein recommended for

preservation or special management. In come cases, AECs may encompass other areas--such as marsh zone wetlands--which are not extensively treated in this inventory.

Peat mining has particular implications for these natural areas, some of which overlay exploitable peat deposits. Mining will remove natural vegetation, permanently alter the hydrology of the region, lower surface soil types from high organic histosoils to the clayey, sandy, and loamy soils typical of other parts of the outer coastal plain. Thus, natural communities, once mining is complete, almost certainly could never be re-established or reclaimed on mined-out land. Preservation of the best natural areas, and appropriate hydrological management, is necessary prior to and during active peat mining.

The Natural Heritage Program is most pleased to have had this opportunity to conduct this project for the Office of Coastal Management. The inventory has revealed a number of high quality natural areas that possess natural elements of national and statewide priority and are important parts of North Carolina's natural diversity. Some of the identified sites were previously unknown and undocumented by the state's scientific community. The Natural Heritage Program hopes that these areas will be protected for the benefits of present and future generations of North Carolinians and for the preservation of the state's truly exceptional natural heritage.

Charles E. Roe, Coordinator
N.C. Natural Heritage Program
November 18, 1982

INTRODUCTION

Purposes of Study

The goals of this study were to identify and map the most significant "natural areas" of the county. These include exemplary physical features, exemplary plant communities, and special habitats. Special habitats-- habitats harboring rare species and/or notably large populations-- may or may not be associated with exemplary physical features or plant communities. Also, we prepared reports, according to Natural Heritage Program specifications, on natural areas that had not previously been reported on.

Brief Description of Carteret County

Excluding water area, Carteret is a medium-sized (land area about 340,000 acres) but long (axis oriented generally WSW-ENE) county on the central North Carolina coast. Especially prominent physical features are the great length of barrier islands (including a Carolina cape-- Cape Lookout); large shallow sounds and other estuaries); extensive tracts of salt marshes, especially the irregularly flooded marshes (ca. 38,600 acres), which are primarily in the NE half of the county; and extensive pocosins-- poorly drained flatlands dominated by stunted pond pines (Pinus serotina) and several broadleaf evergreen shrubs. Also notable are several Pleistocene relict beach ridge complexes with their associated Carolina bays. These ridges support the majority of longleaf pine (Pinus palustris) woodlands and savannahs found in the county.

Until recent years, the great majority of the land area of the county was "undeveloped". As recently as 1965, most towns and communities, agriculture and sylviculture were largely restricted to well-drained sections of the mainland adjacent to the estuaries or larger drainage systems. Since then the barrier island Bogue Banks has been converted from a mostly undeveloped to a mostly developed island. In the last decade, vast areas of pocosin (which formerly totaled over 118,000 acres in the county) have been converted to sylviculture and agriculture. One agricultural enterprise alone, the Open Grounds Farm, has converted over 30,000 acres of pocosin to agriculture. Only about half of the original pocosin area of the county remains. Most of this is in Croatan National Forest in the western half of the county.

Public lands that contain significant areas of physical features, plant communities, and special habitats are Cape Lookout National Seashore (generally unaltered barrier islands); Cedar Island National Wildlife Refuge (vast area of mostly unaltered irregularly-flooded salt marsh-brackish marsh); Croatan National Forest (Pleistocene relict beach ridge complex with Carolina bays, pocosin, freshwater ponds, exemplary longleaf pine savannah); Theodore Roosevelt Natural Area (Holocene relict beach ridge complex vegetated with maritime forest and other plant communities).

Previous Work on Natural Areas of County

Being the site of one or more marine science laboratories since the turn of the century, Carteret County has long had a wealth of literature dealing with the marine biology and ecology of the area. However, broad studies of terrestrial sites and land plants and animals have begun only recently. The broadest (in terms of area covered) studies we have seen are Engels (1952) (vertebrate animals of Shackleford Banks); Fisher (1962) (geology of all former inlet sites); Fisher (1967) (geology of relict beach ridges on mainland and barrier islands); Au (1969) (ecology, plant communities, plant species lists of Shackleford Banks); Godfrey and Godfrey (1976) (geology and ecology of Core and Shackleford Banks); Mixon and Pilkey (1976) (detailed geology of majority of county); Fussell (1978) (plant communities and terrestrial verebrate animals of Bogue Banks); Osborn and Custer (1978) (thorough censuses and maps of all wading bird colonies in 1975 and 1976); Synder (1978) (plant ecology, plant communities of portion of Croatan National Forest); Parnell and Soots (1979) (thorough censues and maps of all waterbird colonies in 1977). In addition to these major papers, we have in the past and as part of this study gone over many (probably hundreds) papers dealing either directly or indirectly with the geology and biology of the county.

Our primary source of information regarding the numerous localities of endangered, threatened, and other rare species was the Natural Heritage Program's data bank computer printout of reported occurrences.

Thirteen reports to the Natural Heritage Program on significant natural areas in the county - Fuller (1978), Wilson (1978), Wilson and Fuller (1978), Fussell and Wilson (1979), Otte and Whetstone (1979), Wilson and Fussell (1979), and Fussell and Wilson (1980) - have been done prior to this study. They include some of the highest priority areas; these reports are included with this study.

This Study

This study was conducted from July to December 1980.

During July and August, we did preliminary literature searches and mapping. We reviewed the Natural Heritage Program computer print-out on Carteret County, contacted several persons who are knowledgeable about different aspects of the natural areas of the county, reviewed orthophotoquads, 1971-1979 aerial photography, and topographic quadrangles, and reviewed the unpublished Soil and Conservation Service soil survey of the county. We purchased several 1971ASCS aerial photographs for use in field work. Some persons contacted were: Dr. Gene Huntsman, Bob Simpson, Rick Carraway, and Mike Alford-- all local outdoorsmen; Dr. Frank Schwartz-- ichthyologist at UNC Institute of Marine Sciences; Dr. Julian-- herpetologist at College of Charleston, has done much collecting in this county; John Collier-- county land surveyor; Susan Schmidt-- Office of Coastal Management at Morehead City; and Charles Johnson-- invertebrate zoologist at the N.C. Marine Resources Center on Bogue Banks.

While designating and mapping tentative natural areas, we stressed areas in which significant physical features, plant communities, and special habitats were "clumped". We also thought in terms of a general cross-section of physical and biological features, e.g. what is the best example of Pleistocene beach ridges, Holocene beach ridges, Carolina bays, pocosins, etc.

On 25 August, we made a systematic two hour flight over the county with the county surveyor, John Collier. We hoped to further evaluate potential naturel areas from the air and to ascertain if all the large roadless areas shown on the most recent State Forest Service map of the county (shows all roads) made in 1978 were still intact. Our flight accomplished the second goal but not the first; we found aerial photographs to be more helpful.

From the first week of September through November, we surveyed 23 areas we had identified as being of potential interest. We compiled four long reports and 19 short reports on these areas. In general we made long reports for the most significant or most complex areas, and made short reports on the less significant or the "simplest" (although these might be significant) areas-- e.g. a tract of pocosin that's primary value is in its large roadless extent. We made no report on one very significant area-- the largest pocosin in Croatan National Forest. However, we did survey three adjacent smaller

pocosins. We were not able to visit "Luken's Island" which is very inaccessible and which may be a highly significant area; we compiled a report on that area based on observations by a person who is very knowledgeable about the area. Approximately 4-5 days in the field were required for each area described by a long report. Also, for each of these areas, we included data previously collected by us at various times as early as 1970. Approximately one day in the field was spent at each of the areas described by a short report.

From late October to December, we refined our maps of selected natural areas and compiled the reports. Approximately 3-4 days were required for each of the long reports and one day for each of the short reports.

Our final report includes: 1) a set of topographic quadrangles and a set of orthophotoquads, each with primary physical features, plant communities, and special habitats mapped; 2) a "key" describing primary values and a general rating of all mapped areas; 3) copies of our 13 previous reports on natural areas of the county; 4) our 23 reports prepared for this study.

Recommendations

Descriptions of the county's natural areas of greatest ecological significance are included in this document. These are (see Map 1):

National and Statewide Priority Areas

Carrot Island-Horse Island-Bird Shoal Complex
Cedar Island Marshes
Cedar Island-North Bay Barrier Island
Core Banks and Portsmouth Island
Croatan Pocosins
Millis Road Longleaf Pine Savanna and Pocosin
Patsy Pond Natural Area
Shackleford Bank
Theodore Roosevelt Natural Area

Regional Priority Areas

Atlantic Natural Area
Browns Island
Emerald Island Woods
Hadnot Creek on White Oak River
Hadnot Creek Ponds and Longleaf Pine Woodlands
Masontown Pocosin
North River Marshes
Pringle Road Carolina Bays
Sea Gate Woods
Union Point Pocosin
Walker's Mill Pond
Wildberry Woods

Information on other sites reported on by Fussell and Wilson or others may be obtained on request from the Natural Heritage Program, NC DNRCD. These sites include:

Alligator Tram Road Loblolly Pine Forest
Crow Hill (Huntley's) Impoundment
Fort Macon Park Natural Area
Grantsboro "Shoreline"
Hunter's Creek
Jarrett Bay Waterfowl Impoundment
Little Deep Creek Road Pocosin
Luken's Island
Lake Ellis-Simon Sweet Gum Forest
Nine Foot Road Ponds
Northwest Prong of Newport River
Southwest Prong of Newport River
U.S. Forest Service Road 177 Longleaf Pine Woodland
Ward's Creek Marshes
White Oak River and Cedar Point Marsh
Wolf Swamp

Lastly, in Map 1, we have shaded the most significant colonial waterbird colonies in the county, i.e. those having over 500 nests of breeding brown pelicans (endangered). Details about these colonies are in the "key" accompanying the topographic quadrangles.

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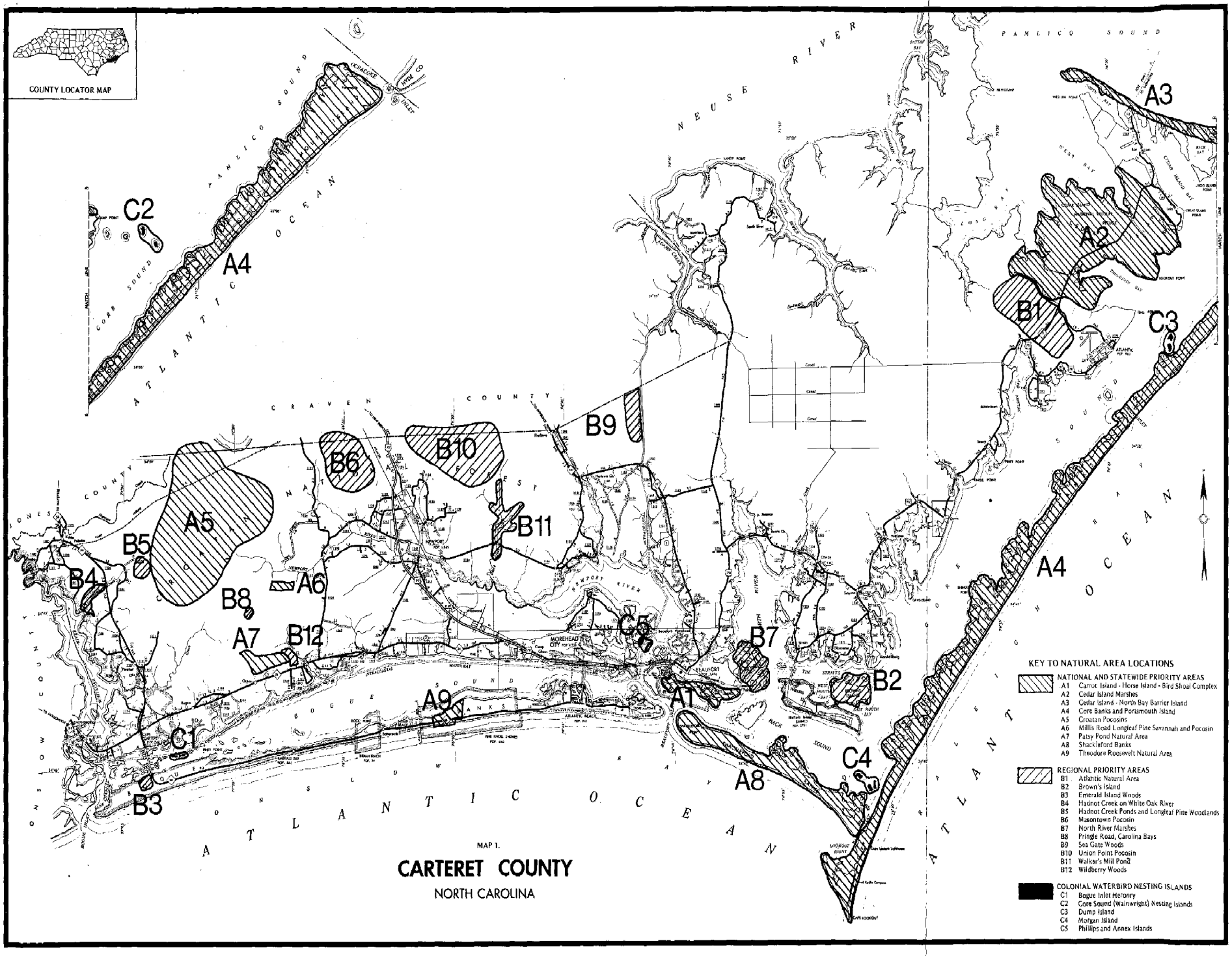

COUNTY LOCATOR MAP
A1
A2
A3
A4
A5
A6
A7
A8
A9
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
C1
C2
C3
C4
C5
KEY TO NATURAL AREA LOCATIONS
NATIONAL AND STATEWIDE PRIORITY AREAS
A1 Carrot Island - Horse Island - Bird Shoal Complex
A2 Cedar Island Marshes
A3 Cedar Island - North Bay Barrier Island
A4 Core Banks and Portsmouth Island
A5 Croatan Pocosins
A6 Millis Road Longleaf Pine Savannah and Pocosin
A7 Patsy Pond Natural Area
A8 Shackleford Banks
A9 Theodore Roosevelt Natural Area
REGIONAL PRIORITY AREAS
B1 Atlantic Natural Area
B2 Brown's Island
B3 Emerald Island Woods
B4 Hadnot Creek on White Oak River
B5 Hadnot Creek Ponds and Longleaf Pine Woodlands
B6 Masontown Pocosin
B7 North River Marshes
B8 Pringle Road, Carolina Bays
B9 Sea Gate Woods
B10 Union Point Pocosin
B11 Walker's Mill Pond
B12 Wildberry Woods
COLONIAL WATERBIRD NESTING ISLANDS
C1 Bogue Inlet Heronry
C2 Core Sound (Wainwright) Nesting Islands
C3 Dump Island
C4 Morgan Island
C5 Phillips and Annex Islands
ATLANTIC OCEAN
CRAVEN COUNTY
JONES COUNTY
CARTERET COUNTY
PAMLICO SOUND
NEUSE RIVER
CORE SOUND
BOGUE SOUND
NEWPORT RIVER
MOREHEAD CITY
BEAUFORT
THE STRAITS
MAP 1.
CARTERET COUNTY
NORTH CAROLINA

Carrot Island-Horse Island-Bird Shoal Complex

Name of Area: Carrot Island, Horse Island, Bird Shoal, and associated spoil islands.

County: Carteret

Location Description: The area covered by this report is all high land and all intertidal land (mud and sand flats and marshes) that is bounded by Taylor Creek on the north, North River on the east, Beaufort Inlet on the south, and Bulkhead Channel on the west. (See Map 2.)

Topographic Quadrangle Map: Beaufort and Harkers Island.

Ownership: Recently acquired by the State of North Carolina for management by the N.C. Office of Coastal Management as the Rachel Carson National Estuarine Sanctuary.

Report Prepared by: Jeannie Wilson and John O. Fussell, III.

Date: August 1979

Other persons knowledgeable about site:

JoAnne Powell, Hampton Mariners Museum, Beaufort, N.C. 28516. Chairman of the Carteret County Environmental Resources Comm.

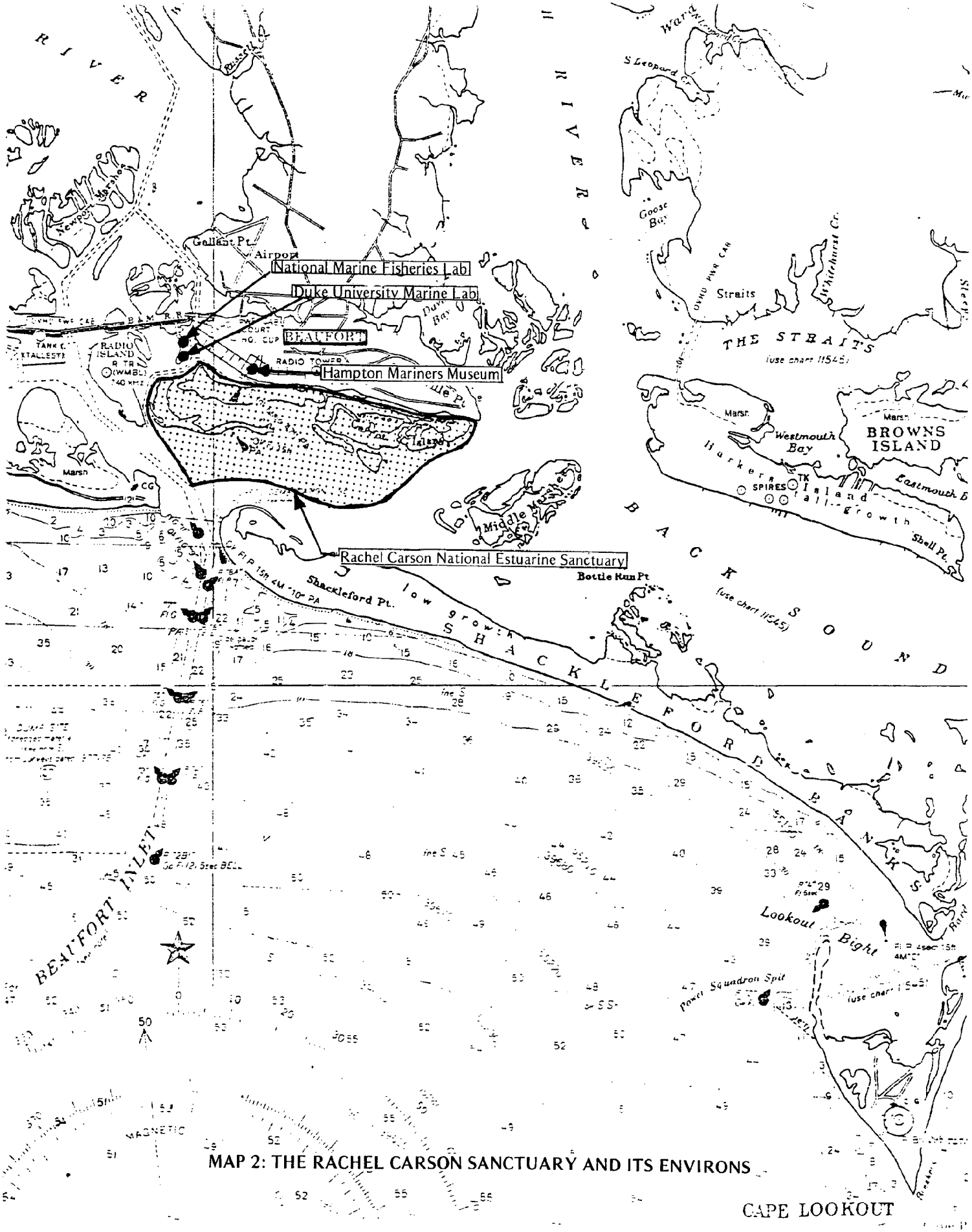
Several individuals at the Duke University Marine Laboratory and the National Marine Fisheries Laboratory are knowledgeable about the Bird Shoal area. Perhaps the two most notable are:

Dr. John Costlow (Director of the Duke University Marine Laboratory). He was instrumental in securing funds for the purchase of the Carrot Island area to protect it from development. One of Dr. Costlow's students in the "homosapiens and the marine environment" course, Spring 1979, Lisa Blumenthal, prepared a report on management guidelines for the Bird Shoal-Carrot Island area; and

Dr. William Kirby-Smith (on the staff at Duke University Marine Laboratory). He is knowledgeable about the marine invertebrates of the Bird Shoal area.

Two other persons that are knowledgeable about the site, because of their involvement in the effort to protect Carrot Island from development and the effort to procure funds to purchase it, are:

James King, 1400 Front St., Beaufort, He was the leader of the citizens group that organized to protect Carrot Island; and



MAP 2: THE RACHEL CARSON SANCTUARY AND ITS ENVIRONS

Warren Davis, Beaufort attorney. He was the attorney who represented the above citizens group.

Several other long-time residents of the Beaufort bare are knowledgeable about the Bird Shoal-Carrot Island area, particularly its human history, as the kinds of and degrees of human influences on the area. One such person is:

Claude Guthrie, 213 Pollock St., Beaufort, N.C. (former custodian at the National Marine Fisheries Laboratory).

Current Use and Protection Status:

1. Current uses:

a) Scientific Research. Because of the proximity of Duke University Marine Laboratory and the National Marine Fisheries Laboratory (and also the U.N.C. Institute of Marine Sciences, Morhead City), the Bird Shoal-Carrot Island area, as well as surrounding estuarine areas, is among the biologically most studied estuarine sites in the world. Many published scientific papers were based on research done on the Bird Shoal area.

b) Education. Scores (maybe hundreds) of organized groups use Bird Shoal for field trips every year. These range from elementary school age to adults. Most field trips are associated with Duke University Marine Laboratory or the Hampton Mariners Museum.

c) Recreation. Bird Shoal and the associated spoil areas are used for swimming, sunbathing, picnicking, and shell-collecting. These activities are mainly restricted to the period from May to September. Most fishing and much shell-fishing is recreational rather than commercial. There is some hunting for rails (marsh hens) in autumn, but very little duck hunting (mostly in the Carrot Island-Horse Island area). Each year, several persons visit Bird Shoal-Carrot Island to go bird-watching.

d) Esthetic Value. This sort of value is hard to evaluate. However, probably most Beaufort residents would agree that the "open space" of the Bird Shoal area to the south greatly enhances the "atmosphere" of the Beaufort waterfront. Actually, esthetics was probably the motivation for most Beaufort citizens' involvement in the effort to protect Bird Shoal-Carrot Island from development.

e) A strip along the north and west sides of Bird Shoal and Carrot Island - i.e. along Taylor Creek and Bulkhead Channel - has been used regularly for the deposition of spoil material when these water bodies are dredged.

f) An ostensibly minor, but probably ecologically important, use of the Bird-Shoal-Carrot Island area is as a grazing area for several privately owned horses (at least they are claimed to have owners).

g) The Bird Shoal area is used to some extent by the commercial fishery. Considerable "clam-kicking" was obvious on Bird Shoal in the winter 1978-1979. Some oystering is done in the area near Horse Island and a few nets are often set in this area. In fall "hauling for mullet" is done on the outer beach of Bird Shoal. The above are direct contributions of Bird Shoal-Carrot Island to the commercial fishery. Of course, the area's major contribution to the commercial fishery would be more indirect, i.e. as a productive nursery ground (mainly the marsh and eelgrass areas) for species that are harvested elsewhere.

2. Protection Status:

The State of North Carolina will have acquired by the Fall of 1983 approximately 2,025 acres of islands, marshes, intertidal flats, tidal creeks, and shallow estuarine waters. Land areas include Carrot Island, Horse Island, Bird Shoal and Town Marsh. A Management Plan has been developed and reviewed extensively by Beaufort citizens, scientists and local officials. It will be submitted by July 1, 1983 to the Federal Office (OCRM) for approval.

Contact Person: Sanctuary Coordinator
Office of Coastal Management
Raleigh, N. C. 27611
919/733-2293

Vegetation and Plant Communities:

The "original" topography of the Bird Shoal-Carrot Island area, amplified by spoiling operations of this century, has contributed to a large diversity of habitats in a relatively small area. There are:

1) deep water areas adjacent to Bird Shoal-Carrot Island, i.e. Beaufort Inlet, Bulkhead Channel, Taylor Creek, and North River.

2) some deep water (not exposed by tides) areas within the study site, i.e. the deeper tidal creeks, the deeper open water near Horse Island, and the relatively deep "bay" at the west end of Bird Shoal. These areas have some eelgrass (Zostera marina) growth, but it appears to be sparse.

3) oyster rocks. There is also a small section of rock breakwater.

4) mud flats. Flats are most muddy adjacent to Horse Island and at the west end of Bird Shoal. At the last location, the muddiness is probably largely due to spoiling operations in this century.

5) sand flats. The flats of Bird Shoal near Beaufort Inlet, especially in the southeastern section of the shoals, are sandy. This broad area of sand flats may be the largest area of intertidal sand flats in the state.

6) the inlet beach. This is the strip of slightly elevated land that lies between the intertidal section of Bird Shoal and the inlet. It is submerged only by extreme tides. In the last 3 or 4 years, this strip of land has begun to "build up" and some small sea oats (Uniola paniculata) dunes have developed.

7) Spartina alterniflora marshes. Most Spartina alterniflora is grazed intensively by the horses. The only ungrazed areas are the deeper areas of Town Marsh and the marshes of Carrot Island.

8) High marsh-low meadow areas are common along the lower slopes of the spoil sites. Species composition changes with elevation. Juncus roemerianus, Spartina patens, and Fimbristylis spadicea adjacent to the Spartina alterniflora, changes to Andropogon virginicus and other species further up the slopes.

9) maritime shrub thicket. This is most common on dredge spoil along the north side of Carrot Island. However, there is also shrub thicket on the natural ridge along the south side of Carrot Island. Dominant shrub thicket species are red cedar (Juniperus virginiana), live oak (Quercus virginiana), and loblolly pine (Pinus taeda). The "natural" shrub thicket appears to have a greater species diversity than the spoil shrub thicket and at least one species that doesn't occur in the spoil shrub thicket-palmetto (Sabal minor).

10) the sparsely vegetated domes of the spoil sites. The most common plants here are little bluestem (Andropogon scoparius) and camphorweed (Heterotheca subaxillaris).

11) non-tidal pools. Most of these may dry up occasionally and the salinity probably varies greatly. Some have a growth of widgeon grass (Ruppia maritima). These pools are mostly restricted to the spoil areas, but there is a natural one on Horse Island.

Physical Features:

The primary physical features of Bird Shoal-Carrot Island-Horse Island complex are:

1) the long strip of spoil material (up to 10-15 feet in elevation) that stretches from North River along Taylor Creek and the south toward Beaufort Inlet. This strip is broken only at two points - the tidal creek near the west end of Carrot Island and the tidal creek through Town Marsh.

2) the vast intertidal flat that makes up much of the central and southern part of the complex.

3) the narrow "beach" that separates the intertidal flat from Beaufort Inlet.

4) the remnant of Town Marsh (Spartina alterniflora) at the northwest end of the complex and the fairly large expanse of Spartina alterniflora marsh at Carrot Island.

5) the low ridge vegetated with shrub thicket hammocks along the south side of Carrot Island. This ridge is on old (1800's) charts. Perhaps it is a relict beach ridge. The ridge is sand on the surface. It would be interesting to know if the sand continues down, or if it is only along the immediate surface with mud or marsh peat just below it.

Rare Plants and Animals:

Plants: Probably none.

Marine invertebrates:

Annelida	
Polychaeta	
Chaetopterus variopedatus Parchment tube worm	Special concern
Mollusca	
Gastropoda	
Busycon canaliculatum Channeled whelk	Special concern
Busycon carica Knobbed whelk	Special concern
Busycon contrarium Lightning whelk	Special concern
Pelecypoda	
Panopea bitruncata Atlantic geoduck-one record at Bird Shoal	Special concern

Reptiles and Amphibians:

Atlantic Loggerhead turtle (Caretta caretta caretta, (endangered in North Carolina) probably occur, at least occasionally, in the adjacent inlet, and they might rarely nest on the inlet beach of Bird Shoal.

Birds:

Species	Status at Bird Shoal	Status in N.C.
Brown pelican	perm. res.	Endangered
Great blue heron	perm. res.	Special concern
Great egret	perm. res.	Special concern
Snowy egret	perm. res.	Special concern
Little blue heron	perm. res.	Special concern
Louisiana heron	perm. res.	Special concern
Black-crowned night heron	perm. res.	Special concern
Yellow-crowned night neron	summer res.	Special concern
American bittern	winter visitant	Undetermined
Glossy ibis	rare visitant	Special concern
White ibis	perm. res.	Special concern
Black duck	winter visitant	Special concern
Turkey vulture	winter visitant	Threatened
Marsh hawk	winter resident	Undetermined
Osprey	summer res.	Special concern
Peregrine falcon	fall trans. winter vis.	Endangered
Merlin	fall trans. wint. vis.	Threatened
Piping plover	perm. res.may nest	Special concern
Wilson's plover	summer res. nests	Special concern
Gull-billed tern	summ. res. sometimes nests	Spec. concern
Common tern	summ. res. sometimes nests	Special concern
Least tern	summ. res. nests	Special concern
Royal tern	perm. res.	Special concern
Sandwich tern	trans.	Special concern
Black skimmer	perm. res. sometimes nests	Spec. concern
Barn owl	winter res.	Special concern
Purple martin	summer res.	Special concern
Black-and White warbler	transient	Undetermined
Prothonotary warbler	fall trans.	Special concern
Yellow warbler	fall trans.	Special concern

Publications and Scientific References:

Cooper, J.E., S.S. Robinson, and J.D. Funderburg (eds). Endangered and Threatened Plants and Animals of North Carolina N.C. Museum of Natural History. Raleigh.

Fussell, J. 1976. Annotated Checklist of the Birds of the Bird Shoal-Carrot Island-Horse Island complex. unpublished manuscript. (based on approximately 150 visits to the area 1971-1976).

Radford, A.E., H.E. Ahles, and C.R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. UNC press. Chapel Hill

Flora Species List:

Eelgrass:

Zostera marina	eelgrass

Pools on Spoil:

Bacopa monnieri	bacopa
Ruppia maritima	widgeon grass

Beach:

Herbs:

Amaranthus pumilus	seabeach amaranth
Atriplex patula	orach
Cakile edentula or harperi?	sea rocket
Euphorbia polygonifolia	sea spurge
Salsola kali	Russian thistle
Sesuvium portulacastrum	sea purslane
Suaeda linearis	sea blite

Graminoids:

Fimbristylis spadicea	Fimbristylis
Spartina patens	salt marsh cord grass
Uniola paniculata	sea oats

Dunes and sandy soil(spoil):

Shrubs:

Croton punctatus	croton
Iva imbricata	seaside elder
Myrica cerifera	wax myrtle
Tamarix gallica	salt cedar
Yucca aloifolia	Spanish bayonet

Vines:

Calystegia sepium	hedge bindweed
Cynanchum palustre	cynanchum
Ipomoea sagittata	morning glory
Rubus trivialis	dewberry
Smilax auriculata	greenbriar, catbriar
Strophostyles helvola	sea bean

Herbs:

Achillea millefolium	milfoil, yarrow
Cassia fasciculata	partidge pea
Chenopodium albun	lamb's quarters
C. ambrosioides	Mexican tea

Herbs:

Cnidoscolus stimulosus	sand nettle
Diodia teres	diodia
Erigeron canadensis	horseweed
Euphorbia polygonifolia	sea spurge
Gaillardia pulchella	Gaillardia
Heterotheca subaxillaris	camphorweed
Hydrocotyle bonariensis	pennywort
Lactuca sp.	wild lettuce
Lepidium virginicum	poor man's pepper
Lippia nodiflora	lippia
Medicago lupulina	black medicago
Melilotus alba	sweet white clover
Monarda punctata	bee-balm
Oenothera humifusa	evening primrose
O. laciniata	evening primrose
Opuntia drummondii	prickly pear
Oxalis dillenii	sourgrass
Paronychia riparia	paronychia
Physalis viscosa ssp. maritima	ground cherry
Phytolacca americana	poke
Plantago aristata	plantain
P. lanceolata	plantain
Portulaca oleracea	sea purslane
Rumex acetosella	sheep sorrel
Sabatia stellaris	sabatia
Solanum gracile	nightshade
Solidago sempervirens	seaside goldenrod
Trifolium campestre	low hop clover
T. repens	clover
Xanthium strumarium	cocklebur

Graminoids:

Andropogon scoparius	little blue stem
Cenchrus longispinus	sandspurs
C. tribuloides	sandspurs
Cynodon dactylon	Bermuda grass
Muhlenbergia capillaris	muhly
Setaria geniculata	foxtail grass
Spartina patens	salt meadow hay
Uniola paniculata	sea oats

Salt marsh:

Herbs:

Agalinis maritima	gerardia
Atriplex patula	orach
Limonium carolinianum	sea lavendar
Salicornia virginica	glasswort
Spiranthes vernalis	spring lady's tresses

Graminoids:

Distichlis spicata	salt grass
Fimbristylis spacicea	fimbristylis
Juncus roemerianus	black needlerush
Spartina alterniflora	salt marsh cordgrass
S. patens	salt meadow hay

High Marsh Meadow (on spoil):

Shrubs:

Baccharis halimifolia	groundsel-tree, cottonbush
Borrichia frutescens	sea ox-eye
Iva frutescens	marsh elder
Kosteletskya virginica	seashore mallow

Vines:

Melothria pendula	creeping cucumber
Mikania scandens	climbing hempweed

Herbs:

Aster tenuifolius	marsh aster
Atriplex patula	orach
Centella asiatica	centella
Eupatorium capillifolium	thoroughwort
Galium hispidulum	bedstraw
Lythrum lineare	loosestrife
Pluchea foetida	marsh fleabane
Portulace oleracea	sea purslane
Salicornia virginica	glasswort
Samolus parviflorus	water pimpernel
Suaeda linearis	sea blite

Graminoids:

Andropogon virginicus	broomsedge
Cladium jamaicense	sawgrass
Elymus virginicus	rye grass
Fimbristylis spadicea	fimbristylis
Panicum virgatum	panic grass
Scirpus robustus	bulrush
Setaria geniculata	foxtail grass
Spartina patens	salt meadow hay

Maritime Shrub Thicket:

Trees:

Diospyros virginiana	persimmon
Juniperus virginiana	red cedar
Morus alba	white mulberry
Osmanthus americana	wild olvie
Persea borbonia	red bay

Trees:

Pinus taeda	loblolly pine
Prunus angustifolia	chickasaw plum
P. caroliniana	laurel cherry
Quercus virginiana	live oak
Salix caroliniana	carolina willow
Xanthoxylum clava-herculis	hercules club, toothache tree

Shrubs:

Aralia spinosa	hercules club
Baccharis halimifolia	groundsel-tree, cottonbush
Bumelia lycioides	buckthorn
Hypericum hypericoides	St. John's wort
Ilex vomitoria	yaupon
Ligustrum japonicum	privet
Myrica cerifera	wax myrtle
Pittosporum tobira	pittosporum
Rhus copallina	winged sumac
Sabal minor	palmetto
Yucca gloriosa	yucca
Callicarpa americana	American beauty berry

Vines:

Ampelopsis arborea	peppervine
Gelsemium sempervirens	yellow jessamine
Lonicera sempervirens	coral honeysuckle
Melothria pendula	creeping cucumber
Passiflora lutea	passion flower
Rhus radicans	poison ivy
Smilax bona-nox	greenbriar, catbriar
S. rotundifolia	greenbriar, catbriar
Vitis rotundifolia	muscadine grape

Herbs:

Galium hispidulum	bedstraw
Hydrocotyle bonariensis	pennywort

Graminoids:

Elymus virginicus	rye grass
Panicum virgatum	panic grass

Ferns:

Asplenium platyneuron	ebony spleenwort

Fauna Species List:

Amphibians:

Possibly none. There is little or no fresh water.

Reptiles:

We have observed only two species:

Carolina diamondback terrapin common in tidal creeks	Malaclemys terrapin centrata
Corn snake	Elaphe guttata guttata

Species that are possible or probable:

Snapping turtle	Chelydra serpentina
Atlantic loggerhead	Caretta caretta caretta
Green anole	Anolis carolinensis carolinensis
Six-lined racerunner	Chemidophorus sexlineatus sexlineatus
Eastern glass lizard	Ophisaurus ventralis
Northern black racer	Coluber constrictor constrictor
Rough green snake	Opheodrys aestivus
"Greenish" rat snake	Elaphe obsoleta obsoleta X E. obsoleta quadrivittata

Mammals:

We have observed:

River otter	Lutra canadensis
Gray fox	Urocyon cinereoargenteus
Norway rat	Rattus norvegicus
Marsh rabbit	Sylvilagus palustris
Horse	Equus caballus
Atlantic bottlenose dolphin	Tursiops truncatus

Possible or probable are:

Raccoon	Procyon lotor
Eastern harvest mouse	Reithrodontomys humulis
Rice rat	Oryzomys palustris
Meadow vole	Microtus pennsylvanicus

Birds:

Species	Status
Common loon	winter resident
Red-throated loon	winter resident
Horned grebe	Winter resident
Pied-billed grebe	winter resident
Audubon's shearwater	one record
White pelican	two records
Brown pelican	permanent resident
Double-crested cormorant	winter resident
Great blue heron	permanent resident
Green heron	summer resident-nests
Little blue heron	permanent resident
Cattle egret	summer visitant
Reddish egret	one record
Great egret	permanent resident
Snowy egret	permanent resident
Louisiana heron	permanent resident
Black-crowned night heron	permanent resident
Yellow-crowned night heron	summer resident
Least bittern	summer resident
American bittern	winter visitant
Glossy ibis	rare visitant
White ibis	permanent resident
Canada goose	winter visitant
Snow goose	one record
Mallard	winter visitant
Black duck	winter visitant
Pintail	winter visitant
Green-winged teal	winter visitant
Blue-winged teal	transient
American wigeon	winter visitant
Northern shoveler	transient
Greater scaup	winter visitant
Lesser scaup	winter visitant
Common goldeneye	winter visitant
Bufflehead	winter resident
Ruddy duck	winter visitant
Hooded merganser	winter resident
Red-breasted merganser	winter resident
Turkey vulture	winter visitant
Sharp-shinned hawk	fall transient, winter resident
Marsh hawk	winter resident
Osprey	summer resident
Peregrine falcon	fall transient, winter visitant
Merlin	fall transient, winter visitant
American kestrel	winter resident
Bobwhite	permanent resident-nests
Clapper rail	permanent resident-nests
Virginia rail	fall transient
Sora	transient
American coot	fall transient
American oystercatcher	permanent resident-nests

Species	Status
Semipalmated plover	permanent resident
Piping plover	permanent resident-may nest
Wilson's plover	summer resident-nests
Killdeer	winter resident
glack-bellied plover	permanent resident
Ruddy turnstone	permanent resident
American woodcock	winter visitant
Common snipe	winter visitant
Long-billed curlew	winter resident (rare, 1974-1978)
Whimbrel	transient
Upland sandpiper	one record
Spotted sandpiper	transient
Willet	permanent resident-nests
Greater yellowlegs	permanent resident
Lesser yellowlegs	transient
Red knot	permanent resident
Purple sandpiper	one record
Pectoral sandpiper	transient
White-rumped sandpiper	transient
Least sandpiper	winter resident
Curlew sandpiper	one record
Dunlin	winter resident
Short-billed dowitcher	winter visitant
Stilt sandpiper	transient
Semipalmated sandpiper	transient
western sandpiper	winter resident
Marbled godwit	winter resident
Hudsonian godwit	two records
Sanderling	permanent resident
American avocet	one record
Wilson's phalarope	one record
Northern phalarope	one record
Parasitic Jaeger	one record
Glaucous gull	one record
Great black-backed gull	permanent resident
Herring gull	permanent resident
Ring-billed gull	permanent resident
Laughing gull	permanent resident
Bonaparte's gull	winter resident
Gull-billed tern	summer resident-sometimes nests
Forster's tern	permanent resident-sometimes nests
Common tern	summer resident-sometimes nests
Least tern	summer resident-nests
Royal tern	permanent resident
Sandwich tern	transient
Caspian tern	fall transient
Black tern	fall transient
Black skimmer	permanent resident-sometimes nests
Rock dove	permanent resident
Mourning dove	permanent resident-nests
Barn owl	winter resident

Species	Status
Short-eared owl	winter visitant
Chuck-will's widow	summer resident? may nest?
Common nighthawk	summer resident-nests
Chimney swift	summer resident
Belted kingfisher	winter resident
Common flicker	fall transient
Yellow-bellied sapsucker	winter visitant
Eastern kingbird	fall transient
Great crested flycatcher	fall transient
Tree swallow	fall transient
Bank swallow	fall transient
Rough-winged swallow	summer resident
Barn swallow	summer resident
Purple martin	summer resident
Blue jay	permanent resident
Common crow	permanent resident
Fish crow	permanent resident-probably nests
House wren	winter resident
Carolina wren	permanent resident-nests
Long-billed marsh wren	winter resident
Short-billed marsh wren	winter resident
Mockingbird	permanent resident-nests
Grey catbird	permanent resident-nests
Brown thrasher	permanent resident-nests
American robin	winter visitant
Hermit thrush	winter visitant
Ruby-crowned kinglet	winter visitant
Water pipit	winter resident
Cedar waxwing	winter visitant
Loggerhead shrike	rare visitant
Starling	permanent resident
Red-eyed vireo	fall transient
Black-and-white warbler	transient
Prothonotary warbler	fall transient
Orange-crowned warbler	winter resident
Northern parula	fall transient
Yellow warbler	fall transient
Yellow-rumped warbler	winter resident
Prairie warbler	summer resident-nests
Palm warbler	fall transient
Common yellowthroat	winter resident
American redstart	fall transient
Bobolink	fall transient
Eastern meadowlark	permanent resident-nests
Red-winged blackbird	permanent resident-nests
Boat-tailed grackle	permanent resident-nests
Common grackle	summer resident-probably nests
Cardinal	permanent resident-nests
Painted bunting	summer resident-nests

Species	Status
Purple finch	winter visitant
pine siskin	winter visitant
American goldfinch	winter visitant
Rufous-sided towhee	permanent resident-nests
Savannah sparrow	winter resident
Sharp-tailed sparrow	winter resident
Seaside sparrow	permanent resident-nests
Field sparrow	winter visitant
White-throated sparrow	winter resident
Swamp sparrow	winter resident
Song sparrow	winter resident
Snow bunting	winter visitant

Ecological Significance:

1) The Carrot Island-Bird Shoal area is a significant "field laboratory". It is used heavily for scientific research and education. Scientific references to Bird Shoal go back to at least 1870.

2) Within the complex, there is one area that can be considered a natural area. It is the ridge of maritime shrub thicket along the south side of Carrot Island. Perhaps this is a relict beach ridge.

3) The Bird Shoal complex is notable for the large number of habitats that occur in relative proximity and especially for the large number of wetland habitats. Such wetland habitats include the inlet beach, oyster rocks, sand flats, mud flats, non-tidal pools, and grazed and ungrazed salt marshes.

4) The numbers of, diversity of, and notable species of marine invertebrates that occur at the Bird Shoal complex are related to the diversity of wetland habitats and to the expanse of intertidal flats. The expanse of intertidal sand flats especially adds to Carrot Island-Bird Shoal's uniqueness. Elsewhere in North Carolina, there are often expanses of intertidal sand flats on the updrift side of inlets, but these are temporary, quickly building into areas that are mostly above the tide's influence.

5) The Carrot Island-Bird Shoal complex is notable as a major roosting area for waterbirds, and for having a rich diversity of shorebirds. It has probably the richest diversity of intertidal shorebirds of any area in North Carolina. Although there is relatively little waterbird nesting on the Carrot Island-Bird Shoal complex, it is an important feeding area for young birds, from nesting sites near Cape Lookout, near Fort Macon, and in the lower Newport River.

At certain times of the year, Carrot Island-Bird Shoal serves as a roosting area for thousands of birds. Particularly large concentrations exist in the fall. The narrow inlet beach is the main roosting area. A notable roosting use of Carrot Island-Bird Shoal is by thousands of Common terns in late September. These birds are apparently migrating southward offshore, and at mid-day, there may be none on the islands. However, about 1-2 hours before sunset, they begin streaming into the islands to roost, and at sunset, there may be thousands present. Carrot Island-Bird Shoal may be extremely valuable to such migrating birds.

Several species of intertidal shorebirds are notable: There are large wintering populations of Dunlins, Short-billed dowitchers, and Western sandpipers. Bird Shoal is an important feeding area for Wilson's plovers (special concern) in summer and Piping plovers (special concern) in winter. Carrot Island-Bird Shoal may have the largest wintering population of Piping plovers along the entire east coast (based on Audubon Christmas Bird Counts).

6) The complex is used by at least two endangered species, two threatened species, and 29 species of special concern. The endangered Brown pelican is a resident using the area for feeding and roosting. The Peregrine falcon is a fall transient/winter visitant. In December 1978, a Peregrine falcon was resident for at least 2 weeks.

7) The complex is important to the esthetic appeal of Beaufort.

Management Recommendations:

In suggesting management recommendations for the Bird Shoal-Carrot Island-Horse Island complex, it is important to stress that the primary biological values of the complex are due to its diversity of wetland habitats and large expanses of mud and sand flats, which have resulted largely from human activities. There is no inconsistency in using management in "preserving" these values.

1) The natural area (the low ridge of shrub thicket) should be recognized as such and protected from alteration.

2) The broad expanse of intertidal mud and sand flats should be maintained. There may be two threats to the continued existence of this expanse of flats:

a) development of the shoals by soil build-up to elevations that are not intertidal. This is apparently slowly happening now. It appears that the sand that is causing the increase in elevation is coming from the erosion of the large spoil mound at the southwest corner of the complex. Spoil from future dredging of Bulkhead Channel should be placed on Radio Island, not on the complex. Spoil material along Taylor Creek, at its present elevation, is not so likely to add to the elevation of Carrot Island-Bird Shoal, but that spoil could "flood" onto the islands during the storm tides of a hurricane. Probably, no further deposition of spoil material on the Bird Shoal-Carrot Island-Horse Island complex is desirable.

b) loss of the sand flat and mud flat habitat by succession to salt marshes. Formerly, Carrot Island-Bird Shoal was subjected to more wave and current action and this was probably the reason salt marshes did not develop. In the last two decades, the development of the elevated inlet beach has created favorable conditions for marsh development. Probably, the horses on Carrot Island-Bird Shoal have been important in preventing marsh succession. (No one who has watched a horse on these islands feed for five minutes would doubt it!). Thus, in this respect, the presence of the horses is desirable.

3) The effect of the horses on the ecology of the complex should be studied (see above). For many people, horses add to the esthetic appeal of the complex.

4) It should be assumed that the complex is not generally good nesting habitat for waterbirds, but some habitat modification might be appropriate. Sites having nesting Least terns (of special concern), Wilson's plovers (Special concern),

and Piping plovers (special concern) are worthy of protection (by posting signs etc.). A colony of almost 100 Least terns on the inlet beach in 1979 apparently had almost no nesting success, and this might have been the result of people who did not realize they were walking through a nesting colony.

The Painted bunting, which is rapidly losing nesting habitat in the state, ks a species for which habitat maintenance/improvement along the spoil site shrub thickets would be appropriate.

5) At current rates of visitation (considering kinds of visitation and the seasons of visitation), people do not detract greatly from the primary values of the domplex. This will probably continue to be true as long as permanent structures do not exist in the complex.

Addenda to Bird Shoal-Carrot Island report:

Soil Information:

Higher ground: Newhan-Carteret complex, 0-30 % slopes

This is a very sandy soil that has a droughty condition. It is not suitable for development, because of drought, narrow dune ridges, and the soil's tendency to shift. Typical species found on this soil type are Uniola paniculata and Ammophila breviligulata.

Marsh: Carteret soils, high phase

These are regularly flooded sandy soils with an excess concentration of salt. It is not suitable for development or agriculture.

Reference:

Soil Conservation Service, U.S. Dept. of Agriculture. 1979. Soil Survey Interim Report, Carteret County, North Carolina (advance copy, subject to change).

Cedar Island Marshes

Name of Area: Cedar Island Marshes

County: Carteret

Location Description: The Cedar Island Marshes are located in the northeastern section of Carteret County. They are bounded by Long Bay and West Bay (arms of Pamlico Sound) to the northwest and north, Cedar Island to the northeast, Core Sound and Thorofare Bay to the southeast, and the Carteret County mainland to the southwest. See Map 1.

Topographic Quadrangle Map: Atlantic & Long Bay

Ownership: Most of the area of the Cedar Island Marshes (which are about 7000 acres in extent) is owned by the U.S. Fish and Wildlife Service. (Total acreage owned by the Fish and Wildlife Service is 9190.6 acres, but some of this acreage is high land at Cedar Island.) A significant area of the southwestern section of the marshes is owned by the U.S. Marine Corps and the Bayland Corporation, but the acreage is hard to estimate because of the poor resolution of the tax maps. We estimate that the Marine Corps owns approximately 500 acres (northwest of N.C. 12) and that the Bayland Corporation owns approximately 500 acres (southeast of N.C. 12). The address of the Bayland Corporation is Fayetteville, N.C.

Report Prepared by: John Fussell, III and Jeannie Wilson

Date: August 1979

Other Persons Knowledgeable about Site:

Mr. Otto Florschutz
U.S. Fish and Wildlife Service
Washington, N.C.

Mr. Dave Rackley
Ecological Services Division
U.S. Fish and Wildlife Service
Raleigh, N.C.

Mr. Ray Whitmore
Assistant Refuge Manager
Mattamuskeet National Wildlife Refuge
Swanquarter, N.C.

Mr. Rick Linthurst
Dept. of Botany
N.C. State University
Raleigh, N.C. 27607

Current Use and Protection Status:

These marshes are largely unaltered. They probably contain the largest contiguous tract of undisturbed irregularly inundated salt marsh in North Carolina. Obvious manmade features in the marshes are: N.C. 12 and two adjacent borrow ditches that bisect the marshes from southwest to northeast, the Thorofare channel that crosses the southwestern section of the marshes, and the John Day Ditch that crosses the northeastern section of the marshes. The effect of these features on the ecology of the marshes is unknown.

The U.S. Fish and Wildlife Service administers all the marshes northeast of the Thorofare channel (approximately 6000 acres). So far, the only alteration of the marshes by the Service has been the blasting of a few "potholes" and some control burning-both to improve habitat for waterfowl. Currently, the Service is considering the impoundment of approximately 2000 acres of marshes northwest of N.C. 12 for waterfowl habitat, especially to improve habitat for nesting Black Ducks.

We do not know of any plans by the Marine Corps or the Bayland Corporation to alter the area of marshes they own. Of course, all the Cedar Island Marshes are designated as an area of environmental concern under the Coastal Area Management Act.

Vegetation and Plant Communities:

The dominant plants of the marshes are Spartina alterniflora, Spartina patens, Spartina cynosuroides, Panicum virgatum, and Juncus roemerianus. Along the southeast side of the marshes (toward Core Sound), Spartina alterniflora (the short form) is dominant. In this area, pond holes (many containing Ruppia maritima) are common. Northwestward toward N.C. 12, the Spartina alterniflora grades into Juncus roemerianus (often intermixed with Panicum virgatum) and Spartina patens. Just northwest of N.C. 12, Spartina patens and Juncus continue to be generally dominant, although in some areas, Spartina cynosuroides is equally common. In the central area of the marshes northwest of N.C. 12, some shrubs (Iva frutescens and Baccharis halimifolia) are present (These can be seen from N.C. 12). Their presence suggests that the area is slightly higher and the ground less moist. Perhaps the composition of grasses, sedges and rushes in that area is different from the rest

of the marshes. Near the mainland (southwest of the Thorofare) and near Cedar Island (northeast of the John Day Ditch), there are extensive areas of fairly pure stands of Juncus roemerianus.

In this report, we are concerned with only the marshes. However, there are also several maritime shrub thicket hammocks on the edges of the marshes, which we did not visit. One of these, Rumley's Hammock, covers several acres and might be of special interest.

Physical Features:

These marshes are essentially level. Lunar tides in this area are very slight and the marshes are flooded only by the tides of tropical cyclones or by the most extreme wind tides. According to Mixon and Pilkey (1976), the marshes are part of a "thin veneer of Holocene saltmarsh peat, mud and sand" that lie on "silty and clayey sand of Pleistocene age".

Rare Plants and Animals:

Plants: none

Reptiles: Water snakes (Natrix spp.) are common in these marshes. Specimens here are probably referable to Natrix sipedon williamenglesi, which was considered by Bruce et al. (in Cooper, J.E., S.S. Robinson, and J.B. Funderburg (Eds) 1977) to be of undetermined status, i.e. the population is deserving of concern but the lack of information makes it impossible to assign it to the proper category of concern.

Birds: We list rare birds in two categories:
1) those directly associated with the marshes and associated pond holes,
2) those occurring only on the adjacent waters and along the marsh-forest border or those that feed above the marshes.

Evaluation of the Site's Ecological Significance:

1) The Cedar Island Marshes are one of the largest contiguous tracts of irregularly flooded salt marsh in the state. They are probably the largest tract of such marsh in the state that contains a significant amount of Spartina patens.

2) The Cedar Island Marshes are relatively unaltered. Elsewhere in the county, most irregularly flooded marshes have been subjected to ditching for mosquito control, especially the more extensive marshes (as just southwest of Davis). Post and Enders (1969) suggested that ditching of salt marshes may be harmful to some species of birds.

3) Many persons believe that this several thousand acre tract of unbroken marsh has a great deal of esthetic value.

4) The Cedar Island Marshes support possibly one rare reptile and several rare birds (see above). However, some less rare birds are also noteworthy. The Marsh hawk, if it nest in the marshes, is probably at its southern limit here. Perhaps, these marshes are most notable for the rail populations present. Probably all U.S. species of rails occur here (although the extremely secretive Yellow rail has not been observed, it probably winters here). King rails (special concern) occur here and may nest. Clapper rails are common. Virginia rails are common here in winter, and a few apparently nest. Here, they are at the southern limit of their nesting range. Soras are probably common in migration. Although not seen or heard, Yellow rails (undetermined status) might actually be common in these marshes in winter. Rail-wise, perhaps the Cedar Island Marshes biggest claim to fame is its Black Rail (undetermined) population. Numbers of these secretive and apparently local birds in these marshes apparently rival those at Elliott Island, Maryland, formerly considered to have the largest Black rail population in the United States. The importance of the Cedar Island Marshes to the Black Rail population in North Carolina may be considerable, but since it is such a secretive species, no one knows if this is the case.

Management Recommendations:

A major value of the Cedar Island Marshes involves its importance to several species of birds that are so secretive that their exact status in these marshes, as well as elsewhere in the state, is largely unknown. Therefore, it would be presumptuous to suggest any hard and fast recommendations. Clearly, this area deserves further study. If the Fish and Wildlife Service plans to impound any marsh acreage, then rail populations, especially King, Yellow, and Black rails, should be ascertained.

Perhaps the best location for impoundments would be adjacent to the mainland and adjacent to Cedar Island, where the marshes have a higher percentage of Juncus roemerianus. This would leave the marshes that are probably the best rail habitat. This would also still leave a large contiguous tract of unaltered marsh.

Fire management should be studied. Probably, fire is "beneficial" to the marsh, at least a certain amount of it helps to maintain it. However, in regards to many of the marsh inhabitants, the alternate burning of several small areas might be desirable to the use of two or three fires that burn the entire marsh and thus remove large areas of cover at one time.

Post, William and Frank Enders. 1969. Reappearance of the Black Rail on Long Island, Kingbird. Vol 19:189-191.

1) Species	Status in C.I. Marshes	N.C. Status
Great blue heron	Permanent resident	Special concern
American bittern	Winter resident (or Perm. resident? may rarely breed)	Undetermined
Great egret	Permanent resident	Special concern
Snowy egret	Permanent resident	Special concern
Little blue heron	Permanent resident	Special concern
Louisiana heron	Permanent resident	Special concern
Black-crowned night heron	Perm. resident	Special concern
Glossy ibis	Summer resident	Special concern
Black duck	Permanent resident(nests)	Special concern
Marsh hawk	Permanent res.(probably nests)	Undetermined
Yellow rail	(no records of this secretive species-probably winter res.)	Undetermined
Black rail	Permanent resident (Probably nests)	Undetermined
King rail	Possible perm. res.may nest	Special concern
Barn owl	Perm. res. (probably nests)	Special concern

2) Species	Status adjacent to C.I.	N.C. Status
Brown pelican	Permanent resident	Endangered
Turkey vulture	Permanent resident	Special concern
Red-tailed hawk	Permanent resident	Special concern
Red-shouldered hawk	Permanent resident	Special concern
Osprey	Summer resident	Special concern
Gull-billed tern	Summer resident	Special concern
Laughing gull	Permanent resident	Special concern
Least tern	Summer resident	Special concern
Common tern	Summer resident	Special concern
Royal tern	Permanent resident	Special concern
Black skimmer	Permanent resident	Special concern
Purple martin	Summer resident	Special concern

Publications and Scientific references:

Cooper, J.E., S.S. Robinson, and J.B. Funderburg (Eds.) 1977. Endangered and Threatened Plants and Animals of North Carolina. N.C. Museum of Natural History, Raleigh, N.C. 444 pages.

Mixon, R.B. and O.H. Pilkey. 1976. Reconnaissance geology of the submerged and emerged coastal plain province, Cape Lookout area, North Carolina. Geological Survey Professional Paper 859, U.S. Govt Printing Off. Washington, D.C.

Flora Species List:

Shrubs:

Baccharis halimifolia	Groundsel-tree, Cottonbush
Borrichia frutescens	Sea ox-eye
Iva frutescens	Marsh elder

Herbs:

Aster tenuifolius	Marsh aster
Atriplex patula	Orach
Ruppia maritima	Widgeon grass
Sabatia dodecandra	Sabatia
Salicornia virginica	Glasswort

Graminoids:

Andropogon virginicus	Broomsedge
Cladium jamaicense	Sawgrass
Distichlis spicata	Saltgrass
Fimbristylis spadicea	Fimbristylis
Juncus roemerianus	Black needlerush
Panicum virgatum	Panic grass
Spartina alterniflora	Salt marsh cordgrass
S. cynosuroides	Cord grass
S. patens	Salt meadow hay
Typha latifolia	Cat-tail

Fauna Species List:

Most of the following were observed by John Fussell during approximately 50 visits to the marshes to study Black Rails, 1974-1978. Many of these visits were made at night.

Amphibians:

Amphibians are ostensibly absent in these marshes. However, about 11 pm. 31 May 1974, there was an apparently huge chorus of frogs in the marshes northwest of N.C. 12. This was four days after a very heavy (3 + inches) rain. Species identified by call were:

Southern toad	Bufo terrestris
Southern cricket frog	Acris gryllus gryllus
Green treefrog	Hyla cinerea
Pine woods treefrog	Hyla femoralis
Little grass frog	Limhaoedus ocularis

Reptiles:

Northern diamondback terrapin	Malaclemys terrapin centrata
Water snake	Natrix sipedon williamengelsi?

These two species are common. Other species probably occur - at least occasionally - especially near shrub thicket hammocks.

Birds:

This list includes only species that occur in the marsh proper or that feed in pond holes in the marsh.

Species	Seasonal Status
Great blue heron	Permanent resident
Green heron	Summer resident
Little blue heron	Permanent resident
Great egret	Permanent resident
Snowy egret	Permanent resident
Louisiana heron	Permanent resident
Black-crowned night heron	Permanent resident
Least bittern	Summer resident (nests)
American bittern	Winter resident
Glossy ibis	Summer resident
Roseate spoonbill	One record
Mallard	Winter res. or perm. res. (may nest)
Black duck	Permanent resident (nests)
Gadwall	Winter resident or Perm. res. (may nest
Pintail	Winter resident
Green-winged teal	Winter resident
Blue-winged teal	Transient
American wigeon	Winter resident
Northern shoveler	Transient
Marsh hawk	Permanent res. (probably nests)
King rail	Probably perm. res. (probably nests)
Clapper rail	Permanent resident (nests)

Species	Seasonal Status
Virginia rail	Permanent resident (probably nests)
Sora	Winter resident (mainly a transient)
Yellow rail	No records of this secretive species Probably a winter resident
Black rail	Permanent resident (probably nests)

The areas of pond holes were not visited during migrations. The following shorebird statuses are conjectural -- only the most likely species are included.

Willet	Summer resident (probably nests)
Greater yellowlegs	Winter resident
Lesser yellowlegs	Transient
Pectoral sandpiper	Transient
Short-billed dowitcher	Winter resident
Long-billed dowitcher	Transient or winter resident
Snowy owl	One record
Barn owl	Permanent resident (Probably nests)
Fish crow	Permanent resident (probably nests on hammocks)
Long-billed marsh wren	Permanent resident (nests)
Short-billed marsh wren	Probable winter resident
Bobolink	Transient
Eastern Meadowlark	Permanent resident (nests)
Redwinged blackbird	Permanent resident (nests)
Boat-tailed grackle	Permanent resident (nests)
Savannah sparrow	Winter resident
Sharp-tailed sparrow	Winter resident
Seaside sparrow	Summer resident(or perm. res., nests)
Swamp sparrow	Winter resident

Mammals:

Raccoon	Procyon lotor
Mink	Mustela vison
River otter	Lutra canadensis
Marsh rabbit	Sylvilagus palustris

Other species undoubtedly occur. Four very likely species are:

Gray fox	Urocyon cineroargenteus
Eastern harvest mouse	Reithrodontomys humulis
Rice rat	Oryzomys palustris
Meadow vole	Microtus pennsylvanicus

Cedar Island-North Bay Barrier Island

Name of Area: Cedar Island-North Bay Barrier Island

County: Carteret

Location: Strand of beaches, dunes, and shrub thickets that fronts Pamlico Sound N and NE of Cedar Island. See Map 1.

Quad: North Bay

Physical/Habitat Feature: Barrier Beach system.

Site Quality: Away from the ferry terminal area, this island system is essentially a natural area.

Elevation: 0-10'

Topography: Cross section of narrow beach, and narrow bare and vegetated low dunes fronting level salt marsh.

Soil Series: Beach and dune soils are Beach-Newhan Association; Marsh soils are Lafitte Muck. SCS. USDA. 1979. Soil Survey of Carteret County, N.C., Interim Report. (Jeannie Wilson).

Size: excluding marshes, ca. 7 miles X ca. 300'.

Geological Formation: Barrier system is a Holocene age. Mixon, R.B. 7 O.H. Pilkey. 1976. Reconnaissance Geology of the Submerged and Emerged Coastal Plain Province, Cape Lookout Area, U.S. Geol. Survey Prof. Paper 859. US Govt. Print. Off.

Endangered & Threatened Species: Brown Pelicans are common.

Potential for Endangered & Threatened Species: Peregrine falcons (endangered) and merlins (threatened) may occur regularly here in fall migration.

Site Integrity: Encroachments are limited to the area that extends from one mile W to one mile E of the ferry terminal. These involve the terminal, nearby cottages, ORV traffic and livestock. The westermost 2 miles of the system are protected by its inclusion in Cedar Island National Refuge; the eastermost 3 miles are protected by the presence of several inlets.

Owners: The westermost two miles of this barrier beach is part of Cedar Island National Wildlife Refuge. The rest is privately owned. The county tax maps are vague due to recent changes in abbreviations, but it appears that ca.

½ mile of the beach adjacent to the refuge has been purchased by a Morehead City realtor -- Joe C. Beam.

Investigator: John Fussell (Report by Fussell and Jeannie Wilson)

Date: November 1980

Other Knowledgeable Persons: Mr. Hubert Brohawn, Cedar Island Wildlife Refuge. Cedar Island, N. C.

Description of Area: Low where developed; high elsewhere. The primary value of this area is its geological "uniqueness". It is by far the most prominent barrier island system along an estuarine shoreline in North Carolina, and on a small scale, has virtually all the features of barrier islands that front the ocean.

This barrier system is ca. 7 miles long and lies WNW-ESE. See Map 3. The section of the island that lies 2-4 miles from the western tip has been humanly altered. Here, there are a few beach cottages, the ferry terminal at the end of N.C. 12, some ORV traffic, and grazing by horses and cows. West and east of this section, these islands are essentially undisturbed. On this visit, only the area west of the ferry terminal was surveyed and the brief description that follows pertains to that area.

This area is an intriguing small scale edition of a barrier island system, complete with beach, dunes, maritime shrub thickets sheared toward the SSW by salt spray, and the back-barrier marshes. There are three inlets, and numerous overwash fans, blow-outs, and peat outcrops on the beach. Thus, the system presents a graphic small-scale edition of a larger oceanfront barrier island system.

The beach, unlike an ocean beach, does have vegetated areas, primarily Spartina alterniflora. However, most of the beach is bare. The dune zone is ca. 200' wide, and the dunes range up to 5-10'. The larger dunes are dominated by Uniola paniculata in some areas, but by Ammophila breviligulata at other sites. Lower areas within the dune zone have a rich diversity of species typical of seaside dunes. The shrub thicket zone is up to 100' wide at some points; at other points it is absent. Quercus virginiana is the dominant species; it averages 6' high and is typically salt sheared. Near the western tip of the system, Myrica cerifera dominates. The back-barrier marsh is nearly pure Juncus roemerianus, but along the marsh-shrub thicket border, there is a rich diversity of brackish/high marsh species.

The westermost two miles of this section of beach is within Cedar Island Wildlife Refuge. This appears to be a significant roosting/feeding area for many species of waterbirds, including brown pelicans. Two dead loggerhead turtles were seen on the beach. This species occurs

regularly in Pamlico Sound, and it is possible that it might rarely nest along these beaches.

The eastern half of the barrier system is probably similar. See Map 3. It has wider inlets and a larger extent of backbarrier marshes, and is likely also a significant roosting/feeding area for waterbirds. Just east of the ferry terminal, where there are many livestock, there is a series of brackish ponds just behind the beach. These are excellent shorebird habitat.

PLANTS OBSERVED (Jeannie Wilson aided in identification)

Trees: (often wind stunted) Diospyros virginiana, Juniperus virginiana, Magnolia virginiana, Pinus taeda, Quercus virginiana.

Shrubs: Baccharis halimifolia, Borrichia frutescens, Hypericum hypericoides, Ilex glabra, Ilex vomitoria, Iva frutescens, Myrica cerifera, Prunus angustifolia, Rhus copallina, Yucca filamentosa,

Vines: Mikania scandeens, Rhus radicans, Rubus trivialis, Smilax bona-nox, Vitis rotundifolia.

Herbs: Ambrosia artemisiifolia, Aster subulatus, Cakile edentula, Chenopodium ambrosioides, Diodia teres, Eupatorium capillifolium, Euphorbia polygonifolia, Gnaphalium obtusifolium, Hydrocotyle bonariensis, Lepidium virginicum, Lythrum lineare, Oenothera sp. (O. laciniata X O. humifusa?), Physalis viscosa, Phytolacca americana, Pluchea foetida, Polypremum procumbens, Portulaca oleracea, Salicornia virginica, Samolus parviflorus, Solanum carolinense, Solidago sempervirens, Solidago tenuifolia, Spergularia mariana,

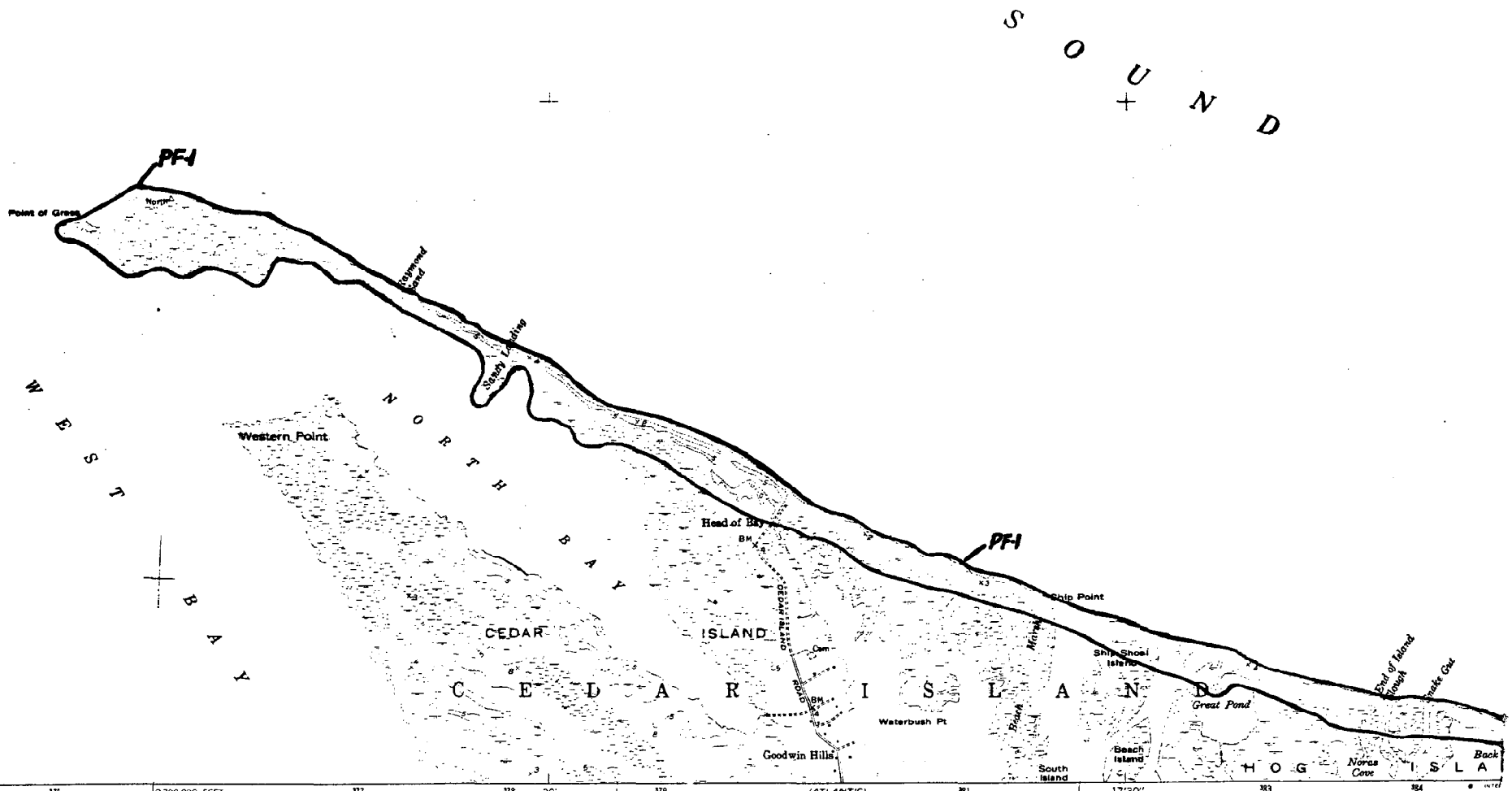
Graminoids: Ammophila breviligulata, Andropogon virginicus, Carex spp., Cenchrus tribuloides, Cynodon dactylon, Cyperus spp., Distichlis spicata, Eleocharis microcarpa, Fimbristylis spadicea, Juncus sp., Juncus roemerianus, Muhlenbergia capillaris, Panicum amarum, Scirpus americanus Spartina alterniflora, Spartina cynosuroides, Spartina patens, Uniola paniculata.

Ferns: Osmunda regalis

ANIMALS OBSERVED

Birds: Common loon, pied-billed grebe, brown pelican, double-crested cormorant, great blue heron, little blue heron, snowy egret, black duck, pintail, black scoter, red-breasted merganser, sharp-shinned hawk, red-tailed hawk, marsh hawk, osprey, clapper rail, killdeer, black-bellied plover, common snipe, greater yellowlegs, red knot, least sandpiper, dunlin (many), sanderling, great black-backed gull, herring gull, ring-billed gull, laughing gull, Forster's tern, royal tern, black skimmer, mourning dove, belted kingfisher, common flicker, barn swallow (one), blue jay, fish crow, gray catbird, house wren, short-billed marsh wren, yellow-rumped warbler, savannah sparrow, sharp-shinned sparrow, swamp sparrow, song sparrow.

Mammals: Raccoon, marsh rabbit.



MAP 3: CEDAR ISLAND-NORTH BAY BARRIER ISLAND

Core Banks and Portsmouth Island

NOTE: For more information consult National Park Service, USDI (1980, 1983). General Management Plan and Final Environmental Impact Statement, Cape Lookout National Seashore.

Name of Area: Core Banks and Portsmouth Island[1]

County: Carteret

Location Description: Cape Lookout, Horsepen Point, Styron Bay, Atlantic, Wainwright and Portsmouth USGS 7.5 min. topographic quad map; stretches east and northeast of Shackleford Bank separated by Barden's Inlet to the boundary of Carteret and Hyde County and separated from Ocracoke Island by Ocracoke Inlet, Cape Hatteras National Seashore. See map 4.

Ownership and Administration: Both Core Bank and Portsmouth Island is owned by the National Park Service (NPS) and administered as part of the Cape Lookout National Seashore.

Size: 21,500 acres.

Land Use: These islands are virtually free of development with the exception of remains of the privately owned "fish camps" built by sport fishermen and the Cape Lookout Lighthouse on Core Bank. Associated with the fish camps were derelict old automobiles and litter. Clean-up operations are in progress to restore the islands to their natural condition. Minimal development of visitor facilities are currently planned on portions of both islands. The NPS management plans call for the following activities and development: ferry service will be provided to three points, to the lighthouse area, Shingle Point and Portsmouth Village. Public transportation exists to the islands via a concession ferry. The most significant development will occur at the docking sites and will be restricted to visitor facilities, ferry docking, ranger station at Cape Lookout and maintenance facilities. The natural area will be open to hiking and fishing. Primitive camping will be confined to the area between Cape Lookout and Shingle Point. Hunting, fishing and shell fishing will continue in designated areas and be regulated according to law.

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[1]Compiled by the Natural Heritage Program, DNRCD, Division of Parks and Recreation, Raleigh, N.C. (1979).

Dangers to Integrity: The existing unnatural conditions will be alleviated upon completion of NPS clean-up operations.

Protection Status: Under NPS management plans, most of the islands will be managed as natural areas.

Reasons for Significance: Core Bank and Portsmouth Island have experienced a variety of historical alterations caused by both human and natural influences. Today they exist as unmanipulated, remote barrier islands and serve as excellent examples of the many stages of barrier island development. In this way they are singularly important to North Carolina's heritage since most other barrier islands have been extensively developed and/or have been subject to unnatural dune and shoreline construction. Limited access to these islands has been the responsible factor in limiting their development. The islands have been left to respond naturally to the forces of wind and ocean. Dramatic geological changes have resulted which are worthy of study.

Core and Portsmouth can be described as long and narrow, low lying barrier islands resembling sand bars because of their extensive berm and shrub-grassland vegetation. The islands are oriented predominantly across prevailing winds; there is little protection from salt spray, and overwash is frequent thus providing little opportunity for successional growth beyond the lush terrestrial grass-like Guthrie's Hammock with its savannah-like appearance. As an indication of the islands' unstable nature and dynamic tendencies, certain conditions prevail: the islands feature the most extensive beach berms, especially Portsmouth which has barren sand in places reaching to the sound side. The development of new dunes can be observed and the concomitant establishment of dune vegetation. Vegetation zonation and sand flats is a result of overwash and terracing rather than exposure to salt spray as observed on islands where the dunes are larger and more stable. Hence, these islands experience vegetation patterns slightly different from what is observed in the Cape Hatteras National Seashore islands since dune stabilization has never been initiated and natural conditions prevail. In contrast to the vast berm new dunes and pioneer grasses, dune slacks closer to the sound side provide mesic conditions where rich, diverse flora can be found. Furthermore, low, flat mesic meadows offer additional diversity. These are below the typical elevation of the flats and closer to the water table. Here grasslands may succeed to woody vegetation if environmental stress is minimized. Blending gradually into the maritime grasslands on the sound side are vast salt marshes which are the site of high biological productivity.

Several rare, uncommon plant and animal species live on these Banks. The Atlantic Loggerhead Sea Turtle nests on the islands.

Designated Natural Area: The natural area includes approximately 20,000 acres on Core and Portsmouth which are outside the development zone (visitor centers, sanitation facilities, etc., ferry docking sites) and the area between Cape Lookout and Shingle Point.

Core and Portsmouth islands are unique in their character and are among the few remaining stretches of the Outer Banks where natural conditions can be enjoyed. For reasons of wilderness, habitat preservation and scientific and educational pursuits, these islands represent a significant measure of the State's heritage.

Preserve Recommendations: Because of the geological and biological diversity, Core Bank and Portsmouth Island should be protected from development and public overuse. The islands serve as an ideal study ground for barrier island ecology-geology, and further studies should be encouraged.

Data Sources: Preston D. Riddle, Supervisor, and staff, Cape Lookout National Seashore, Beaufort, N.C.

Paul J. Godfrey, National Park Service Cooperative Research Unit, University of Massachusetts, Amherst, Mass.

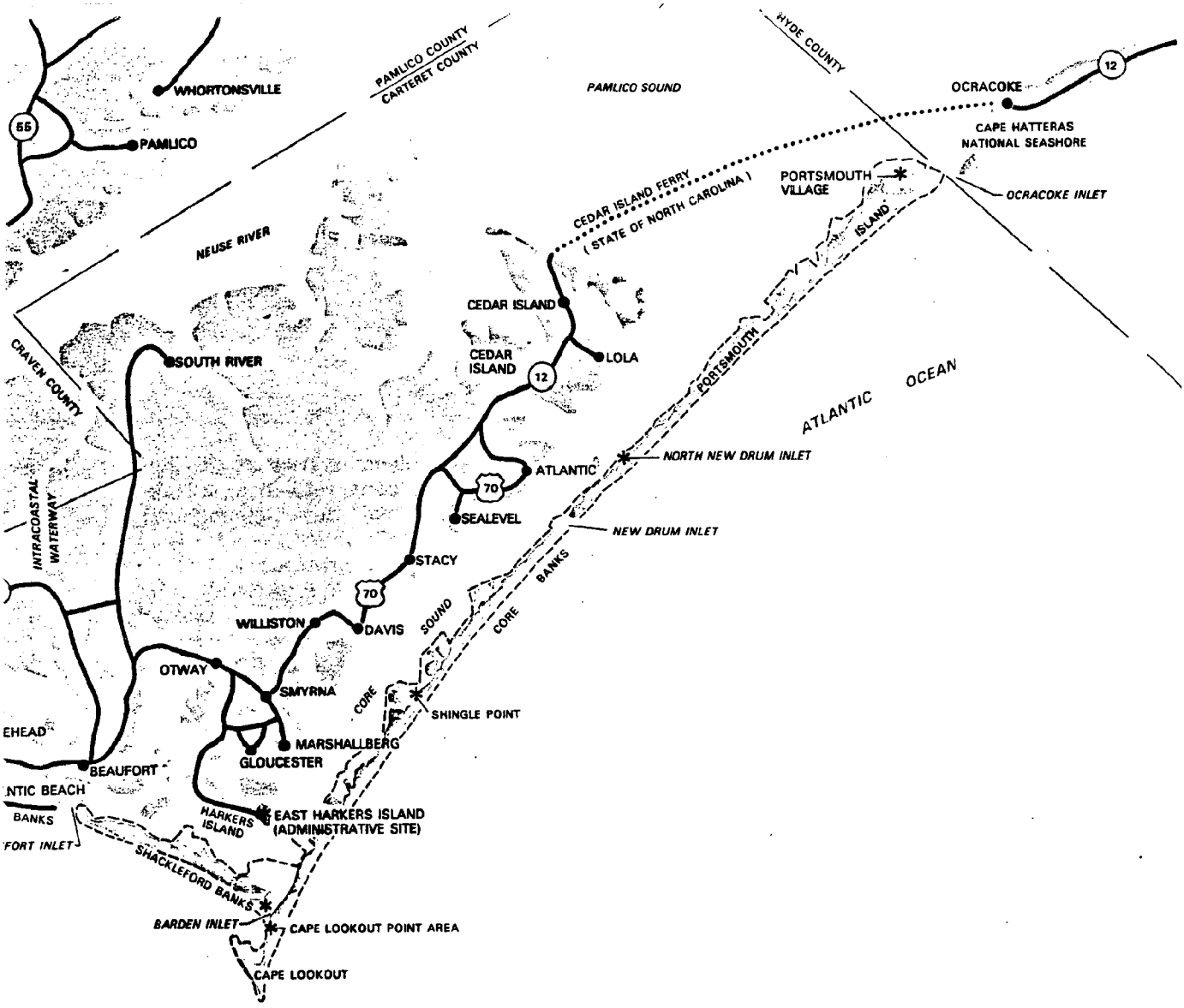
John Fussell, Morhead City, N.C.

National Park Service, General Management Plan and Environmental Impact Statement.

Scientific References: Burk, C. J. (1961) A botanical reconnaissance of Portsmouth Island, North Carolina. Jour. Elisha Mitchell Sci. Soc. 77: 72-74.

Godfrey, P. J. and Godfrey, M. M. (1976) Barrier island ecology of the Cape Lookout National Seashore and vicinity, North Carolina. National Park Service Scientific Monograph Series, No. 9, 160 p.

Documentation and Authentication: Voucher specimens and documentations are on file at the Cape Lookout National Seashore headquarters in Beaufort, North Carolina. See Management Report No. 22: Preliminary Resource Inventory of the Vertebrates and Vascular Plants of the Cape Lookout National Seashore, North Carolina.



------ NATIONAL SEASHORE BOUNDARY

NATURAL ZONE

* DEVELOPMENT ZONE

0 2 4 6 MILES

0 3.2 6.4 9.6 KILOMETERS

N

VICINITY

CAPE LOOKOUT NATIONAL SEASHORE/NORTH CAROLINA

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

MAP 4: CORE BANKS - PORTSMOUTH

Croatan Pocosins

Name of Area: Croatan Pocosins[1]

Location Description: Jones, Craven and Carteret Counties, North Carolina; Maysville 15 min. and Masontown 7.5 min. topographic USGS quad map in Croatan National Forest; central Croatan National Forest, Catfish-Great Lake area. See maps 5-7. Only the area called "Pocosin" lies within Carteret County.

Ownership and Administration: Area owned and administered by the USFS as holdings within the Croatan National Forest. Four sections included in the natural area are those proposed by the USFS as Wilderness - RARE II Areas (roadless and undeveloped areas): Catfish Lake South, Sheepridge, Pond Pine and Pocosin (see map 7). The Low Pocosin area on the west side of Great Lake is premier example of low evergreen shrub pocosin and is critical to maintain the hydrology of the Sheep Ridge pocosin site. The inclusion of the Low Pocosin area recognizes it as a significant and necessary link to maintain the hydrology of the other four areas. While the Low Pocosin area is not included in the USFS proposed Wilderness Area due to the presence of roads, it does meet all the qualifications of a Natural Heritage Area and its inclusion in the natural area is recommended.

Approximate Acreage: Catfish Lake South 7,605 acres (3,042 hectares), Low Pocosin 4,035 acres (1614 hectares), Pocosin 11,000 acres (4,400 hectares), Sheep Ridge 5,380 acres (2,152 hectares), Pond Pine 1,860 acres (744 hectares).

Land Use: The proposed natural areas are restricted in accessibility in that much of the area is covered by impenetrable evergreen shrubs characteristic of pocosins and flooded swamp forests. Maintained roads surround the areas, but none actually transverse them with the exception of the Low Pocosin area; therefore, land use is restricted to hunting along the road edges. The land is reserved primarily for wildlife habitat.

Dangers to Integrity: Massive wildfires are seen as a threat to be controlled by the USFS. Pocosins are fire dependent ecosystems and their successional status depends on both hydroperiod and frequency of fires. Any major change in

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[1]Compiled by the NC Natural Heritage Program, DNRCD, Division of Parks and Recreation, Raleigh, N.C. December (1979).

either or both environmental conditions would result in a change or loss of the original characteristics.

Protection Status: The four RARE II study areas have been proposed by the Forest Service for their protection as wilderness areas and for inclusion in the National Wilderness System. Furthermore, within the Pond Pine section, three hundred acres have been recognized by the USFS as the pond Pine Research Natural Area and are protected as such.

Reasons for Significance: The Croatan National Forest was recently included in a study of the location of peat deposits in North Carolina. The proposed natural area is contained within the area surveyed for peat deposits with the exception of Pond Pine site which is of higher elevation. Within the peatlands (see map 6), the elevation ranges from about 30 feet above sea level to slightly greater than 40 feet above sea level. The highest elevations are associated with the thickest peat thus far found in the Croatan National Forest.

Pocosins are characterized by vegetation which is adapted to periodic fires, low nutrient levels and periodic flooding or high water tables. Pocosins are poorly understood and especially sensitive ecosystems because of complex hydrology combined with particular edaphic conditions and their rugged nature. Thus, these unique features depend on periodic fires and special hydrologic conditions. As a result of extensive peat mining, timbering and draining for agricultural purposes, these lands are rapidly deminishing in area and being converted to commercial use.

The Pocosin Natural Area is dominated by a mixture of pocosin communities:

. Low evergreen shrub pocosin (low pocosin)
. Tall evergreen shrub pocosin (high pocosin)
. Open pond pine

Low pocosins are evergreen shrub bogs populated by Ilex, Zenobia and Titi. Here, stunted Pond pine of only five feet (or less) can be found on the organic soils. The vegetation diversity here is low, but unique species such as the rare yellow pitcher plant and Venus; fly-trap (see Table 1) can be found.

The surrounding or bordering high pocosins have soil with less organic content, although the water table is still high. Here, Pond pine grows to heights of sixty feet and high bay forests predominate.

In the transition from organic soils to mineral substrate are found mixed pine forests (Loblolly or Longleaf pine). Hardwood swamp forest (Black gum, Red maple,

Sweet gum) are found on the better drained mineral soils near drainage creeks. Again, fire and hydrology play a major role in limiting succession of other vegetation forms, and therefore maintain the pocosin's integrity providing habitat for the uniquely adapted species.

Sheepridge and Low Pocosin are prime examples of well developed low pocosin and are considered as best representative of "low pocosin ecosystems" in North Caroina. This section, of higher elevation, is associated with the thickest peat found in the above study. This area is underlain by humic peat ranging from 4-6 feet thick.

The Catfish Lake South section supports a mixture of high shrub pocosin and pond pine woodland. This area is underlain by at least four feet of peat.

Pond Pine, as its name implies, is a prime example of the open Pond pine dominated forest which is found in areas underlain by shallow peat around the edges of peat deposits. In the Pond pine overstory some of the trees are 160+ years old.

The Pocosin section is also covered predominantly by high shrub pocosin and Pond pine woodland. It is believed that this area also should be underlain by well-developed peat deposits.

As the demand for productive agricultural and timber lands increase, these wetlands will come under increased pressure for conversion into commercially productive land. Therefore, it is important to preserve representative segments as natural areas for scientific and educational purposes to accrue knowledge of their biological structure, function and significance. Moreover, wetland habitats such as the impenetrable pocosins are the final refugia for heavily hunted species like the black bear and alligator (see table 2).

Preserve Recommendations: The Pocosin Natural Area is exemplary of the sensitive pocosin ecosystem and contains the best examples in North Carolina of the low shrub pocosin ecosystem. The sites provide habitat for several plants or animals listed as endangered or threatened nationally and within the state of North Carolina. For these reasons, these sites should be protected as an exceptional natural area.

Management Recommendations: A management plan should be developed for the protection of the Pocosin Natural Area as an outstanding natural area. Management should be directed towards: 1) maintaining the existing hydrology of the area through restriction on all draining in the area or areas adjacent which would affect the watertable here; 2) providing (allowing) for fire sufficient to maintain the dominant vegetation now occupying each site (If allowed to develop in the absence of fire, the establishing trees/shrubs will grow and shade out the

present understory, i.e. Pond pine evolves into a bay-type forest.); 3) educating the public by providing information on the uniqueness of the natural area. Heavy equipment used for fire control should be limited to the extent that it produces unsightly or deformed conditions in the natural area.

Data Sources: Fuller, Manley, Fish & Wildlife Service, Intern Washington, DC. (Currently: National Wildlife Fedn., Raleigh, NC)
Huntsman, Gene, Mid-Atlantic Coastal Fisheries Research Center, National Marine Fisheries Service, Beaufort, N.C.
Otte, Lee, Dept. of Geology, ECU, Greenville, N.C.
Synder, J.R., Botany Department, University of Florida, Gainsville, Florida.
Simpson, Bob, Box 643, Morehead City, N.C.
Wills, Richard, District Ranger, Croatan National Forest.

Scientific References: Cermak, R.W. (1976). Establishment Report for Pond Pine Research Natural Area within the Croatan National Forest
Otte, L.J. and R.L. Ingram (1979). Quarterly Progress Report: Peat Resources of North Carolina. Report to North Carolina Energy Institute.
Smithsonian Institute, (1974), Survey of Natural Areas of the Atlantic Coastal Plain, Report for National Park Service.
Snyder, J.R. (1977). Report on the vegetation and site factors of the Pond Pine Pocosin Research Natural Area, Croatan National Forest. USFS Report. Southeastern Forest Experiment Station, Asheville, N.C.

Documentation and Authentication: Voucher specimens for plant species are deposited in the following herbaria: North Carolina State Museum, Raleigh, N.C. Supplementary surveys and descriptions are as listed in the scientific references above. The information contained in this report is well documented and received from reliable resources.

Recognition by Other Agencies: Four of the areas have been recommended as National Wilderness Areas. Three hundred acres of the Pond Pine section have been recognized by the USFS as the Pond Pine Research Natural Area (see map 8).

Table 1. Rare and Endangered Plant Species in: Millis Road Pocosin Natural Area

Scientific Name	Common Name	Status[2] *	Habitat
Dionaea muscipula	Venus' fly trap	TT	Wet sandy ditches, savannahs, open bog
Peltandra sagittaefolia	Arrowleaf shieldwort	TP	Bogs

* These plants are no longer listed as threatened or endangered by the N.C. Department of Agriculture's Plant Protection Program.

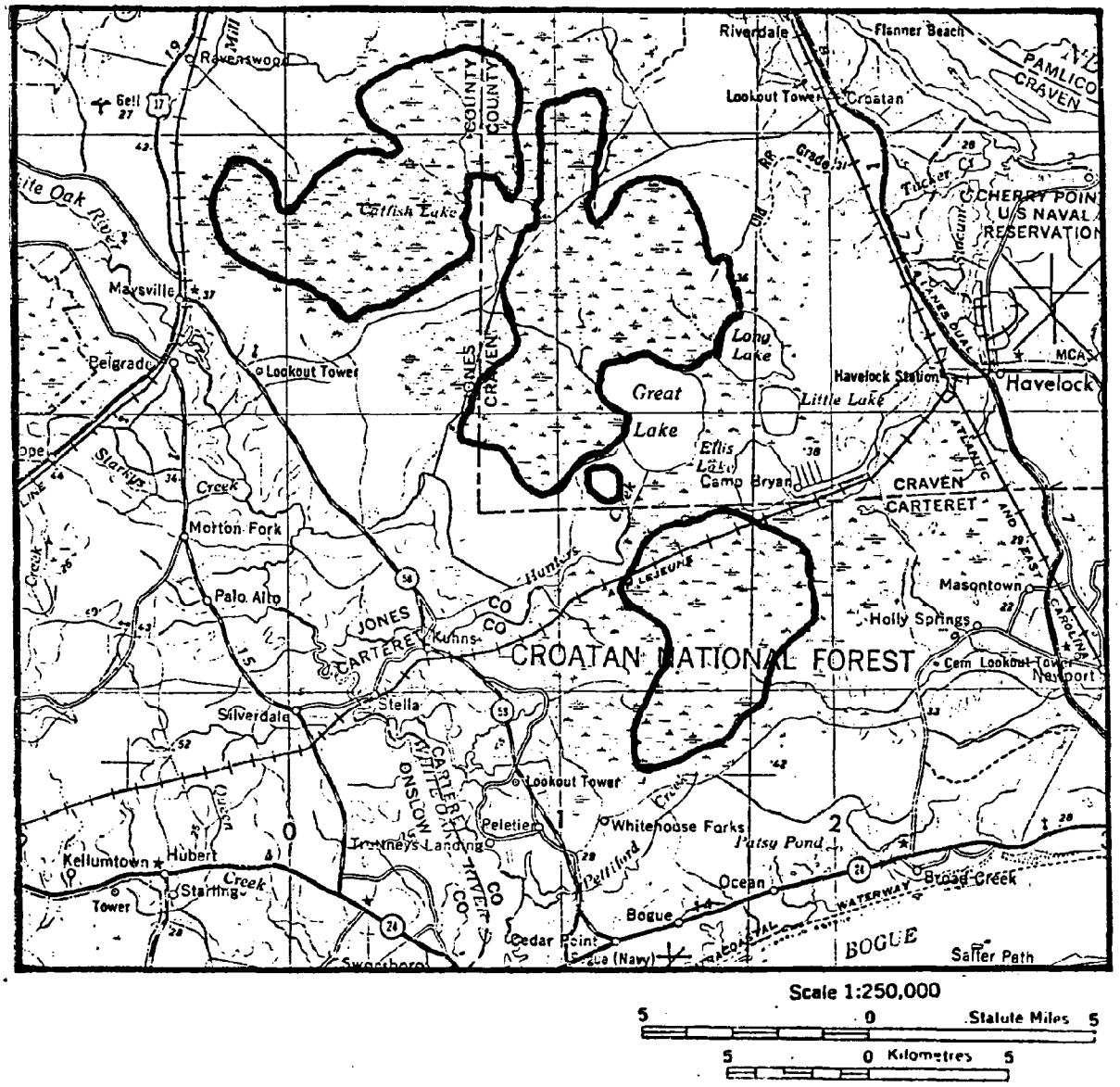
Table 2. Rare and Endangered Animal Species in: Pocosin Natural Area.

Scientific Name	Common Name	Status[2]	Habitat
Alligator mississippiensis	American alligator	E	Great rivers,
Crotalus adamanteus	Eastern diamondback rattlesnake	E	Flatwoods, interspaced w bays or pocosins w sandy ridges
Haliaeetus leucocephalus	Bald eagle	E	Chiefly near oceans, rivers lakes
Pandion haliatus	Osprey	SC	Breed near water
Picoides borealis	Red cockaded woodpecker	E	Pine woodlands longleaf/loblolly
Rana areolata	Gopher frog	SC	Upland sandy ridge temp. or perm. ponds
Ursus americanus	Black bear	SC	

[2]Taken from Cooper, J. E., S. S. Robinson, and J. B. Funderberg (Eds). 1977. Endangered and Threatened Plants and Animals of N. C. N. C. Museum of Natural History, Raleigh, N. C. 444 pages + i-xvi.

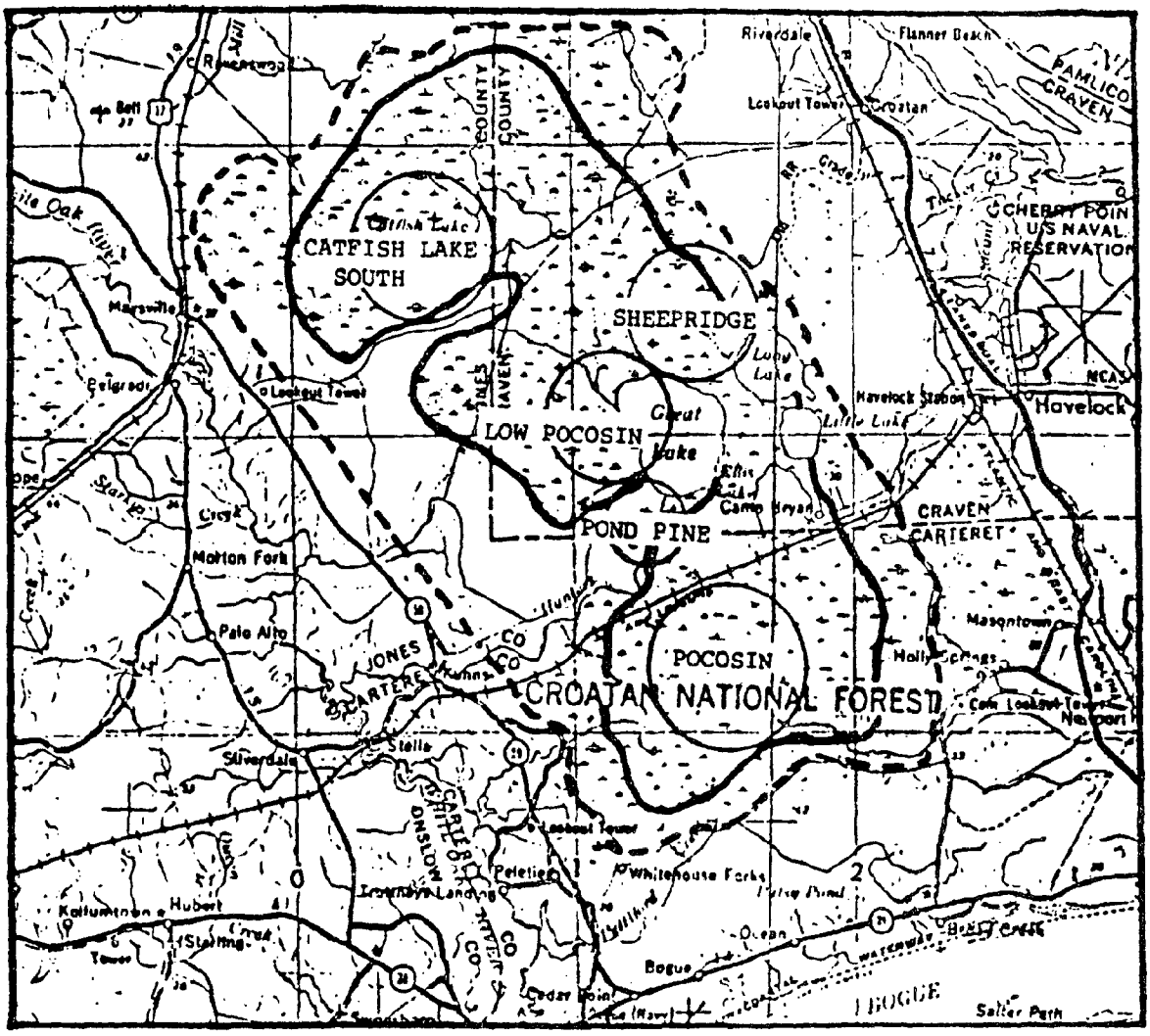
Explanation of Status Categories:

EE - Endangered Endemic	TE - Threatened Endemic	E - Endangered
ED - Endangered Disjunct	TD - Threatened Disjunct	T - Threatened
EP - Endangered Peripheral	TP - Threatened Peripheral	SC - Special Concer
ET - Endangered Throughout	TT - Threatened Throughout	
UD - Undetermined		



MAP 5: CROATAN FOREST PEAT DEPOSITS - OTTE (1980)

8. CROATAN NATIONAL FOREST



---- Area surveyed

—— Area underlain by peat

◯ Pocosin Natural Area sites

Counties: Jones, Craven, and Carteret

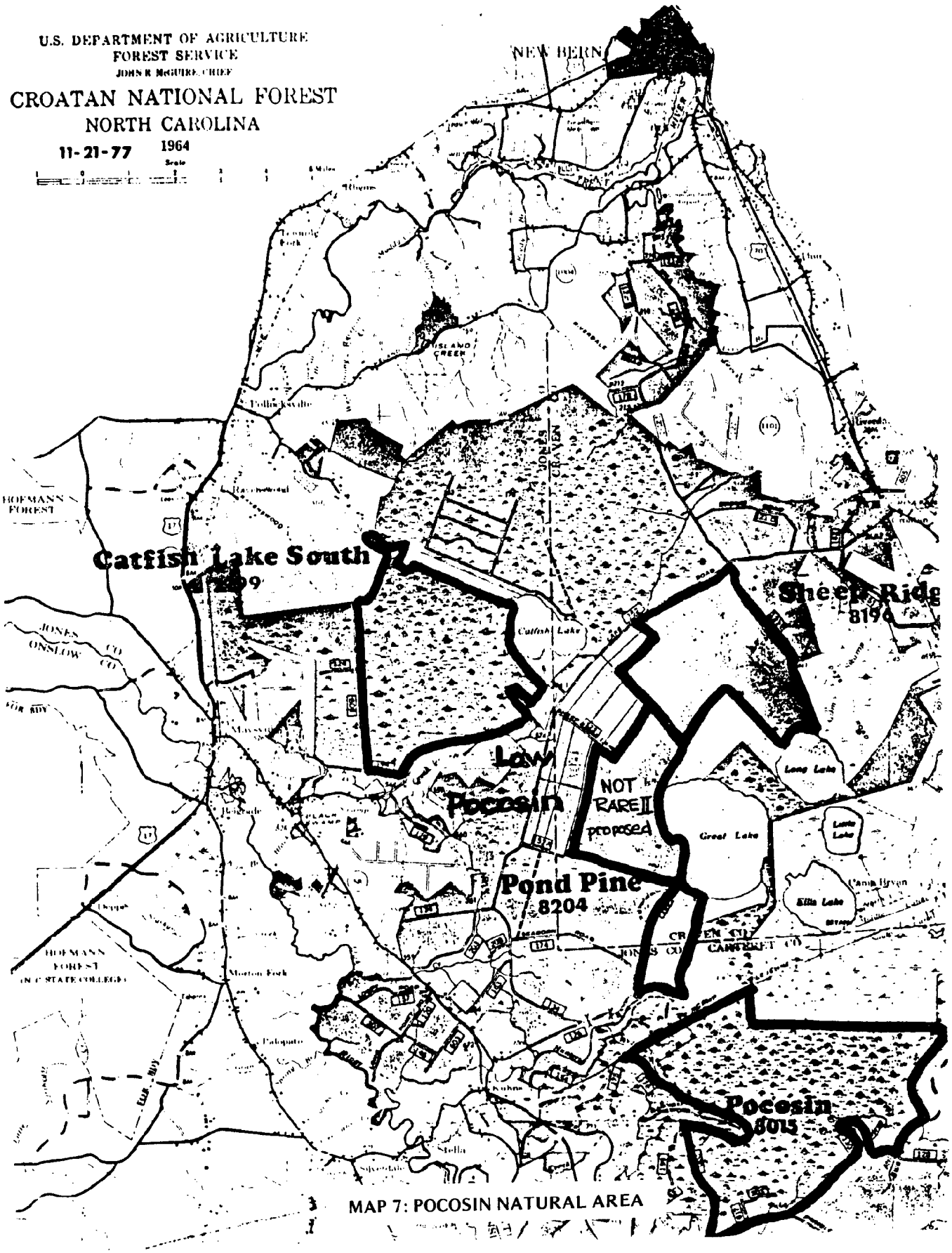
7.5 minute topoquads: Maysville NE, Maysville NW, Maysville SE, and Masontown.

Square miles surveyed: 150

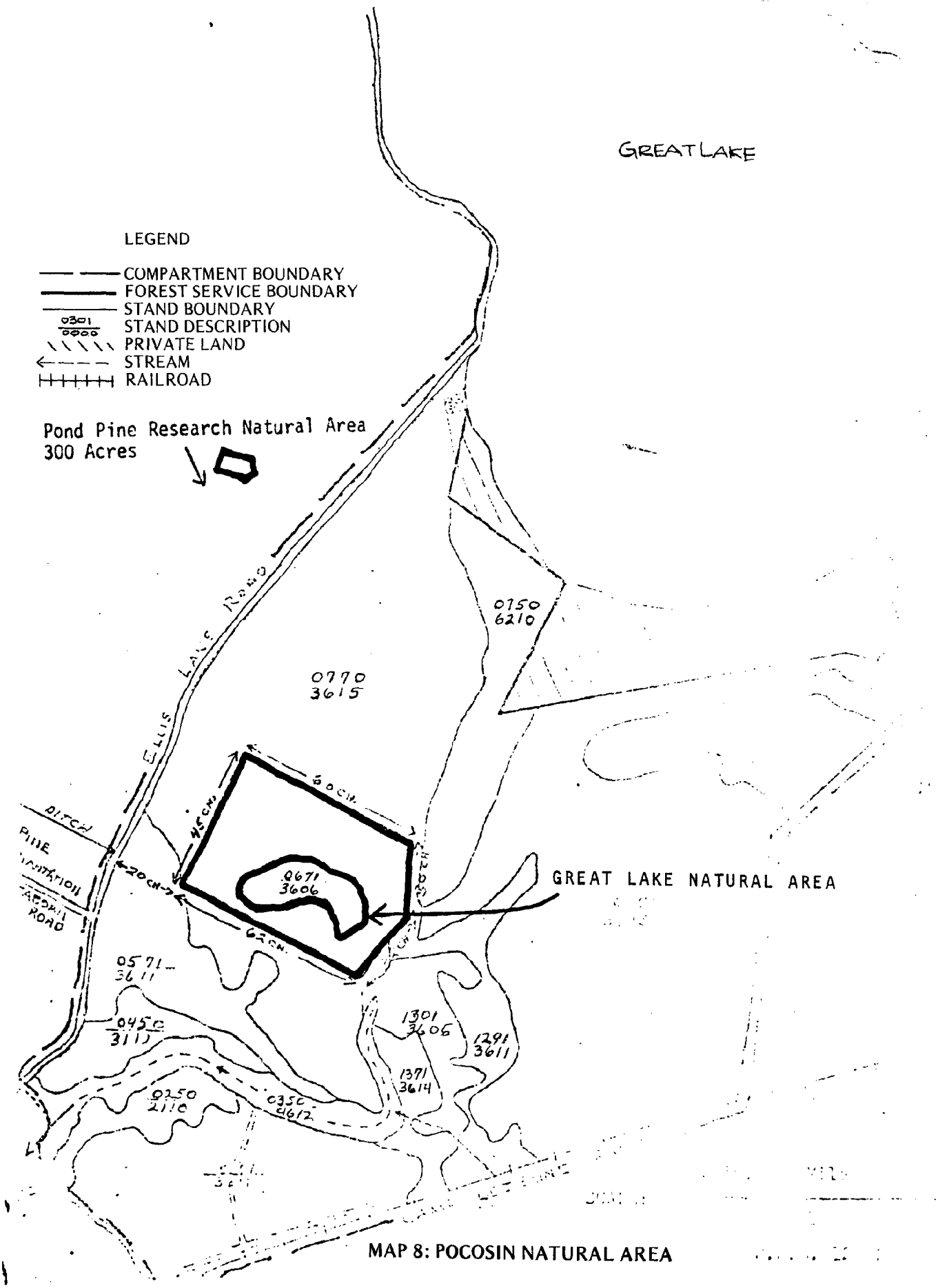
Sites investigated: 92

Taken from Otte (1979)

MAP 6: POCOSIN NATURAL AREA - OTTE (1979)



MAP 7: POCOSIN NATURAL AREA



MAP 8: POCOSIN NATURAL AREA

Millis Road Longleaf Pine Savanna and Pocosin

Name of Area: Millis Road Longleaf Pine Savanna and Pocosin

County: Carteret

Location: Area of low sand ridges and shallow interlying swales in Croatan National Forest. Tract is bounded on the north by Millis Rd. (U.S. Forest Service Road 128); on the east and southeast by Peak "Swamp"; on the south by the large tract of short pocosin that stretches southward to Forest Service Rd. 154-2; on the west by Millis "Swamp" (See Map 9). Coordinates: approx. 34°43'30" N, 77°57'50" W.

Topographic quadrangle: Masontown

Size: Ca. 300 acres (ca. 121 ha)

Elevation: 30-36'

Access: The section of Millis Rd. (Forest Service Rd. 128) adjacent to the tract is 1.4-2.4 miles west of S.R. 1124 (Nine Foot Road).

Names of investigators: John O. Fussell, III
1412 Shepard St.
Morehead City, N.C. 28557
919/726-3476

Jeannie Wilson
Hampton Mariners Museum
Beaufort, N.C. 28516
919/728-7317

Dates of investigation: 1980
Sept. 17, 18, 19
Oct. 7, 8, 15
Nov. 10, 12, 13

Both authors have visited the area on previous occasions. Fussell made numerous trips to the area 1972-1979, primarily in search of red-cockaded woodpeckers, Bachmans sparrows and other bird species. He also made a night trip for herps on July 27, 1980. Wilson visited the area numerous times during 1975-1978, while working on a Master's project nearby.

SITE DESCRIPTION

This 300 acre tract (see map 9) consists of about 200 acres of a Pinus palustris/Aristida stricta community that lies on wide and low sand ridges, about 50 acres of medium-height pocosin that lies in the inter-ridge swales, and about 50 acres of a poorly defined intergradation of Pinus palustris/Aristida stricta with low pocosin along the southern boundary of the tract. (In this report, we use the term pocosin in the broad sense, i.e., area dominated by broadleaf evergreen shrubs, regardless of the topography of the area.)

Ostensibly the tract is nearly level; the slopes between ridges and swales would be imperceptible at most points were it not for the very noticeable differences in plant cover and soil moisture. However, there are moderate slopes at the eastern and western borders of the tract, adjacent to the Peak and Millis "Swamps" (actually bay forests). Along the ridge "crests", the soil is usually xeric; in the swales, only a foot or two lower, there are a few inches of standing water during much of the winter and the soil is usually moist in summer. However, in the early fall of 1980, after a very dry summer, the soil surface in the swales, away from Sphagnum cover, was almost dry.

The sand ridges in this tract are a small part of a large complex of basically NE-SW oriented ridges in this section of the county - the "Newport Barrier" (see Mixon and Pilkey 1976). Apparently, these ridges are relict beach ridges formed during the last major regression of sea-level in the late Pleistocene. In the study area, the three easternmost ridges are well-defined and definitely lie NE-SW. The ridge pattern in the western half of the tract is more irregular and appears to some extent to be the result of an original more prominent pattern that has been dissected by a drainage system that has developed perpendicularly to the ridge-swale pattern. There appears to be one "partial" Carolina bay at the southern edge of the tract.

Plant Communities

The Pinus palustris/Aristida stricta sections of the tract are subjected to prescribed burns about every 3 years. In June 1980, a wildfire swept through the tract, burning the pocosin areas that had not burned for several years. Thus, the physiognomy of this area was slightly different in the fall of 1980 from what it was previously.

(1) Pinus palustris/Aristida stricta. All canopy height sized trees are Pinus palustris; trees occur in a generally sparse stand. Canopy height is about 70'; canopy trees are probably mostly about 50 years old. However, the presence of red-cockaded woodpecker cavity trees in the eastern half of the tract suggests that some trees may be up to about 75 years old. The largest trees are not much over 12" DBH. Very striking is the almost total absence of vegetation at subcanopy and shrub levels. Also striking is the near absence of xerophyllic oaks. In 1980, because of the June fire, Aristida stricta was especially prominent - about 3 feet tall and fruiting throughout the tract (giving it a prairie appearance). It varied from a dense cover on the ridge slopes to a sparse cover on sections of the ridge centers. Herbaceous species composition varies in a continuum from the ridge centers to the ridge slopes.

In the fall of 1980, there was a pleasing floral display. Prominent were Trilisa paniculata, Trilisa odoratissima, Solidago stricta, Liatris graminifolia, and Carphephorus tomentosus.

Plate 1

(2) Inter-ridge pocosin. Before the 1980 fire, the swales supported what might be called medium-height pocosin. There was a moderate stand of Pinus serotina, up to 40-50' high and to 8" DBH. Beneath the pines was a dense 4-8' growth of mixed broadleaf evergreens, which was composed of Ilex coriacea, Lyonia lucida, Persea borbonia, etc. After the fire, these areas were quite different. About one fourth of the Pinus serotina appear to have survived; thus there is now a sparse stand. At the 4-8' level, there is a dense tangle of dead branches covered with a new growth of Smilax laurifolia. Regrowth of broadleaf evergreens was up to 1-2' high; common species at most sites were Ilex glabra, Ilex coriacea, Lyonia lucida and Zenobia pulverulenta. Sphagnum is still abundant at ground level.

Ecotone. Between the Pinus palustris/Aristida stricta community and the swale pocosin, there is a prominent ecotone, which varies in width from almost nothing to 30'. In many sections, the ecotone has a 3' high growth of Tridens flavus, with a lesser amount of Andropogon virginicus, that overtops a 1' high layer of Carex walteriana. Other sections are more open with a wide variety of herbs, including species such as Sarracenia flava, Sarracenia purpurea and Dionaea muscipula. Many species that occur in the 300 acre tract are found primarily in the ecotonal area.

(3) Intergradation of Pinus palustris/Aristida stricta and low pocosin. Within this 50 acre area, there are small patches of small and young Pinus palustris, larger patches of low pocosin, and numerous ecotonal areas. Before the fire, this low pocosin had a sparse stand of very small Pinus serotina (mostly less than 10' tall and 4' DBH) and a dense 1-2 foot growth of broadleaf evergreens. After the fire most Pinus serotina were killed and the dense foot-high shrubs were dominated by Ilex glabra. Also common were Zenobia pulverulenta, Carex walteriana and Woodwardia virginica. Sphagnum covers virtually all the ground area.

We found two rare species in this intergradation zone. These are Agalinis virgata and Sarracenia rubra.

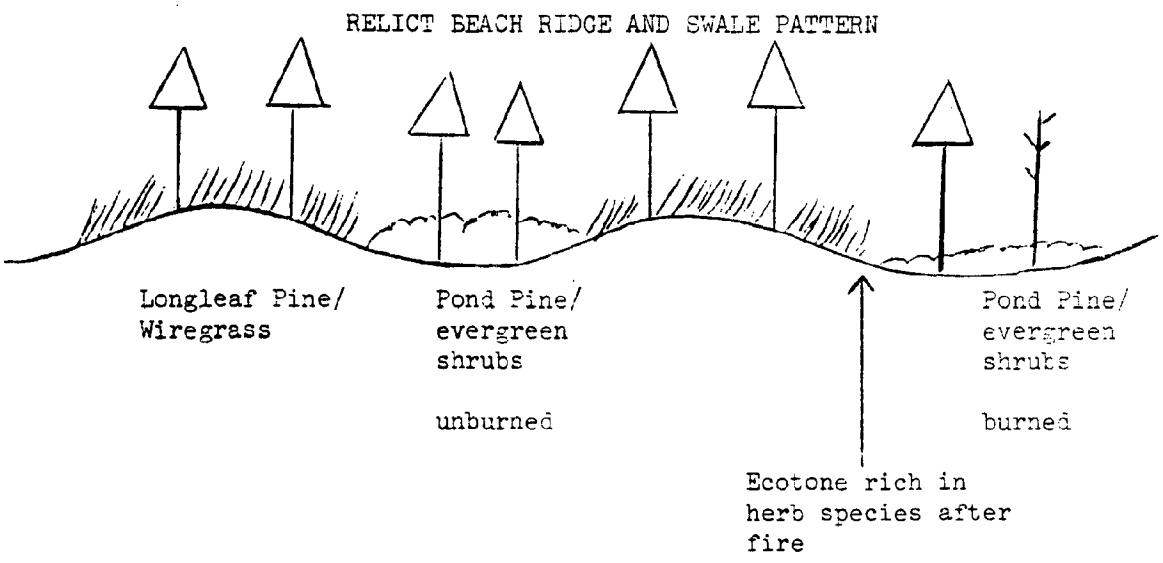


Figure 2

Table 3

10. Significance Summary (See Statement of Site Significance; Endangered & Threatened Species)

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High quality plant community		Pinus palustris/Aristida stricta savannah	Most exemplary tract of community type in county; may be one of most exemplary in state.
Endangered peripheral species	a.	Agalinis virgata: burned over savannah, low pocosin ecotone	Fewer than 5 plants noted. Occurrence on natural site. Most recent county records are on clearcut sites.
Endangered peripheral species		Asclepias pedicellata: savannah	
Federally endangered species		Red-cockaded woodpecker: primarily Pinus palustris/Aristida stricta	Population at tract may be 10 individuals, a notably high number for an area this size in either Carteret County or Croatan National Forest.
Threatened throughout species		Calamovilfa brevipilis: probably savannah-pocosin ecotone, and low pocosin	Population unknown; not seen by us. (Jim Snyder 1977; pers. comm. to J. Wilson)
Threatened endemic species		Dionaea muscipula: savannah-pocosin ecotone	Plants found on natural site; not ditch bank, etc.
Threatened throughout species	b.	Sarracenia rubra: intergrading areas of savannah & low pocosin	These individuals are at northeast limit of species range. Occur on natural site. Other county records are on disturbed areas.
Threatened species		Bachman's sparrow: Pinus palustris/Aristida stricta	5-10 territorial males in 1979. Undoubtedly the largest breeding population in county or National Forest.

Table 3 (cont'd)

a. Feature Map Legend	b. Description of significant feature	c. Comparative assessment
Threatened species	Red-shouldered hawk	Tract is feeding area for individuals that breed in adjacent swamp.
Outstanding geological feature	Well-defined relict beach ridges (Pleistocene)	Such relict beach ridges are common in county, but are rapidly being altered by human disturbance. Ridges within this tract have added distinction of supporting an exemplary plant community.
Potential scientific research site	Pinus palustris/Aristida stricta	In addition to natural values mentioned above, tract is accessible and on public land, and there are several research facilities in the county.
Historical value	Pinus palustris/Aristida stricta ridge system	Best remaining example in county of 19th century and earlier "environment" that was common in county.

11. Ownership type by percent area: Public 100%

12. Number of owners: one

13. Name of owner and supervisor: USDA, Forest Service

Mr. Lynn Young, District Ranger
Croatan National Forest
435 Thurman Rd.
New Bern, N.C. 28560
919/638-5628

14. Use of natural area: Current uses are low-intensity ones. This is managed timberland, but the most recent harvest was a select cut over 10 years ago. The tract is prescribed burned every 2-3 years. Other low-intensity uses are hunting (deer and quail), bird-watching and nature study (wildflowers).

15. Use of surrounding land:

a) Agricultural land (pine plantations) - 20%
b) Wildland - 80%

16.

Management Problem Description	Impact	Effort
Need for fire management	significant feature	continual management essential

17. Preservation status: Public land, not recognized as a natural area.

18. Regulatory protections in force: We know of only one - the Endangered Species Act, but we do not know the exact acreage of the tract to which it applies. There are several red-cockaded woodpecker (federally endangered species) cavity trees in the eastern third of the tract, so at least some of the tract is critical habitat for that species.

19. Attitude of owner or custodian toward preservation: See section 21.

20. Threats: See section 21.

21. Management and preservation recommendation: The preservation of this area is related to:

a) maintenance of present vegetational structure, which includes a sparse stand of canopy height pines, a sparse growth of understory and shrub layer vegetation, and a thick graminoid ground cover. This structure would be altered drastically by clearcutting (some select cutting may not be harmful, but see c. below), and/or absence of regular ground fires. Ground fires greatly increase the height and density of the Aristida stricta cover. Regular ground fires also decrease the probability of a crown fire which would alter the structure of the area. Maintenance of the distinctive plant structure is essential for red-cockaded woodpeckers (federally endangered) and Bachman's sparrows (threatened in North Carolina).

The above refers to the Pinus palustris/Aristida stricta community of the sand ridges. However, within this tract, there are inter-ridge swales dominated by Pinus serotina/mixed broadleaf evergreen shrubs (pocosin vegetation). These pocosin swales and the adjacent ecotonal areas have generally escaped burning during prescribed burns. They are less flammable (wetter) and fire breaks have been dug between the ridges and the swales by the Forest Service to contain fires. Some of the ecotonal areas are affected by the fire breaks. If these areas could be burned regularly, there would be some conversion of broadleaf evergreen shrubs to grass-sedge cover. The entire tract would "benefit" from the intorduction (or re-introduction) of a "fire habitat" that is rarer in this area (county and Croatan National Forest) than is scattered Pinus palustris with a thick growth of Aristida stricta. The resulting vegetation would be scattered Pinus palustris or Pinus serotina or no trees with a very thick growth of more mesophyllic grasses and sedges.

This situation occurred to a moderate extent in June 1980 after an intense wildfire. Before the fire, the ecotonal strips were primarily vegetated with a sparse growth of herbs and shrubs less than one foot in height. After the fire, these same strips had a lush waist-high growth of mixed grasses and sedges. These thick grassy areas (which are thicker than the thickest Aristida cover) may be very important to wintering Bachman's sparrows and Henslows sparrows. Henslows sparrows are undergoing a pronounced nationwide decline in numbers. In the winter of 1979-1980, several searches within the tract for this sparrow turned up one individual. On November 12 and 13, 1980, after the drastic increase in grass cover after the June wildfie, 5 individuals were censused here - a truly noteworthy total.

Although fire eventually leads to a great increase in the density of ground flora, there is virtually no ground cover for awhile. It might be advisable to alternate burning instead of burning the entire tract at one time. For instance, burn the eastern half one year and the western half the next year, etc.

b) maintenance of the diversity of ground flora. This is closely related to the maintenance of vegetational structure discussed above. Those recommendations also apply here, especially the need for frequent ground fires. We re-stress the potential value of more burning in the pocosin and ecotonal areas. Currently, it is the ecotonal areas that harbor the rarest plants on the tract: Calamovilfa brevipilis, Sarracenia rubra, Dionaea muscipula and Agalinis virgata. Increased burning in the ecotonal and pocosin areas could lead to increases in the populations of these species and increase the likelihood of the introduction of other rare savannah species that occur in the general area, but not within the tract.

c) maintenance of the presence of some mature pines. Trees generally 60 years old or older are a necessity for red-cockaded woodpeckers. Increased burning in the pocosin areas could lead to greater red-cockaded woodpecker use of Pinus serotina for cavity trees, and these are generally undesirable timber trees.

The management of the tract by the Forest Service for longleaf pine saw timber is generally consistent with maintenance of the tract in its present high-quality state. The important things are to protect

red-cockaded woodpecker cavity trees, maintain some mature timber (the required amount could be a debatable point), and prescribed burns should be continued on regular, fairly frequent basis. Burning of the pocosin areas within the tract, which we believe would be very beneficial, would probably be generally opposed by the Forest Service because this would be more difficult to carry out. However, it is notable that inter-ridge locations of much of the pocosin within this tract present a relatively practical opportunity to burn pocosin since these areas are "surrounded" by Pinus palustris/Aristida stricta.

Beland (1971) reported that the Forest Service was considering the creation of special "red-cockaded woodpecker management areas", where all management activities would be geared to improvement of habitat for the species. Such areas would be located so that they would be readily accessible to the public for the purpose of public education. This tract would certainly be an excellent "red-cockaded woodpecker management area" or better yet, a "savannah management area". Many persons visit this tract yearly in search of "savannah species". Most of these persons are visitors from other areas, so the tract has some economic value to the county.

22. Rating: High priority.

23. Statement of site significance: (See Table 3).

The tract is highly significant primarily because it includes 200+ acres (generally continuous) of exemplary Pinus palustris/Aristida stricta community. This community is exemplary because of its relatively large size, very open aspect due to recent frequent fire, presence of many fairly mature trees, and the presence of a large number of typical savannah species. The tract has a large number of rare savannah species also: at least 3 endangered (one federally endangered) and 4 threatened species.

The tract is of some geological significance because it lies on a prominent Pleistocene relict beach ridge system. Such beach ridges are common in the county, but are rapidly being destroyed or altered by human disturbance. The tract is also of historical significance, being an "environment" that was prevalent during the early history of our county.

The tract is of scientific interest and has been used in research. It is very accessible, and is a site many persons visit to see "savannah species".

With the moister "pocosin areas" within the tract "surrounded" by Pinus palustris/Aristida stricta areas, there is a situation in which it would be relatively easy to regularly burn these moister areas. This would increase the total area available to mesophytic herbs and increase the populations of the rarer savannah herbs.

24.A. Natural Characteristics Summary

a. Vegetation-Biotic Community Summary

Community Type: Pinus palustris/Aristida stricta

Community Cover Type: Pinus palustris

General Habitat Feature: Savannah

Average tree height: Ca. 70'

Estimated age of canopy trees: 50+ years

Estimated size of association: 200+ acres

Successional stage: Transient, fire-climax

Sere type: Psammosere

Common canopy species in community type (but not dominant): None

Common subcanopy-shrub stratum species in community type (but not dominant): Myrica cerifera var. pumila, Lyonia mariana, Ilex glabra, Vaccinium tenellum

Common herb stratum species in community type (but not dominant): Andropogon scoparius, Rhynchospora spp., Liatris graminifolia, Eupatorium spp., Aster spp.

b. Soil Summary

Soil series: Leon sand

Soil order: Spodosol

pH class: Extremely acid to strongly acid (3.6-5.5)

Moisture class: wet to droughty, cemented pan, excessively drained

c. Hydrology Summary

Drainage basin: Newport River

Hydrologic system: Terrestrial

Hydrologic subsystem: Dry mesic to dry xeric

Water chemistry: Fresh

Water regime: Intermittently saturated to permanently exposed

d. Summary-Topography and Physiography

Topographic site type characteristics

Land form: Ridge crest and slopes

Shelter: Open

Aspect: Ridge-swale pattern runs in NE direction; thus, slopes face SE & NW

Slope angle: Nearly level 0-2° to gently sloping 2-6°

Profile: Generally constant

Surface patterns: Mostly smooth

Position: Entire ridge cross-section

Physiographic site type of natural area: Millis Road Savannah

Physiographic site type of community type: Relict dune ridges within Millis Road Savannah

Geologic Formation: Flanner Beach Formation

Geologic Formation age: Pleistocene

24.B. Natural Characteristics Summary

a. Vegetation-Biotic Community Summary

Community type: Pinus serotina/mixed broadleaf evergreen shrubs/ Sphagnum spp./Smilax Laurifolia. Smilax is more abundant after fire.

Community cover type: Pinus serotina

General habitat feature: Pocosin vegetation in shallow, narrow inter-ridge swales

Average tree height: 40'

Estimated age of canopy trees: 50+ (2 red-cockaded woodpecker cavity trees seen)

Estimated size of association: 50 acres

Successional stage: Transient, fire climax

Sere type: Psammosere

Common canopy species in community type: None

Common subcanopy-shrub species in community type: Ilex glabra,

Lyonia lucida, Ilex coriacea, Myrica heterophylla, Zenobia pulverulenta

Common herb species in community type: Carex walteriana, Woodwardia virginica

b. Soil Summary

Soil series: Murville sand

Soil order: Spodosol

pH class: Extremely acid to strongly acid (3.6-5.5)

Moisture class: Wet, floods, cemented pan, poorly drained

c. Hydrology Summary

Drainage basin: Newport River

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: Fresh

Water regime: Semi-permanently flooded to saturated

d. Summary-Topography and Physiography

Topographic site type characteristics

Land form: Inter-ridge swales

Shelter: Open

Aspect: Not applicable

Slope angle: Nearly level 0-2°

Profile: Not applicable

Surface patterns: None

Position: Entire swale cross-section

Physiographic site type of natural area: Millis Road Savannah

Physiographic site type of community type: inter-ridge swales within Millis Road Savannah

Geologic Formation: Flanner Beach Formation

Geologic Formation age: Pleistocene

24.C. Natural Characteristics Summary

a. Vegetation-Biotic Community Summary

Community Type: Pinus serotina/Ilex glabra-Zenobia pulverulenta/Sphagnum sp. Most pines were killed after the fire.

Community cover type: Pinus serotina before fire, Ilex glabra-Zenobia pulverulenta after fire

General habitat feature: Low pocosin

Average tree height: 6-8'

Estimated age of canopy trees: Not applicable

Estimated size of association: Less than 50 acres

Successional stage: Transient, fire climax

Sere type: Psammosere

Common canopy species in community type: None

Common subcanopy-shrub species in community type: None

Common herb species in community type: Carex walteriana, Woodwardia virginica (herbs and shrubs are at same level)

b. Soil Summary

Soil series: Murville sand

Soil order: Spodosol

pH class: Extremely acid to strongly acid (3.6-5.5)

Moisture class: Wet, floods, cemented pan, poorly drained

c. Hydrology Summary

Drainage basin: Newport River

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: Fresh

Water regime: Semi-permanently flooded to saturated

d. Summary-Topography and Physiography

Topographic site type characteristics

Land form: Low pocosin

Shelter: Open

Aspect: Not applicable

Slope angle: Nearly level 0-2°

Profile: Not applicable

Surface patterns: Hummocky (hummocks of Sphagnum)

Position: Not applicable

Physiographic site type of natural area: Millis Road Savannah

Physiographic site type of community type: 50 acres of plain within Millis Road Savannah

Geologic Formation: Flanner Beach Formation

Geologic Formation age: Pleistocene

References

Mixon, R.B. & C.H. Pilkey. 1976. Reconnaissance Geology of the Submerged and Emerged Coastal Plain Province, Cape Lookout Area. U.S. Geol. Survey. Prof. Paper 859. U.S. Govt Printing Office. Washington, D.C.

North Carolina Dept. of Conservation & Development. 1958. Geologic Map of North Carolina. Division of Mineral Resources.

Soil Conservation Service, USDA. 1979. Soil Survey of Carteret County, N.C. (Interim report).

Snyder, James. 1978. Analysis of Coastal Plain Vegetation, Croatan National Forest, North Carolina. Masters Thesis. UNC, Chapel Hill.

e. Summary - Endangered and Threatened Species - Plants

Name of Species: Agalinis virgata, Branched gerardia

Species Legal status: Endangered peripheral

Number of populations on site: One seen

Number of individuals per population: 5 seen

Size or maturity of individuals: Flowering and fruiting

Disturbance or threats to population: Frequent fire probably needed

Habitat characteristics:

Vegetation association: Ecotone of savannah and pocosin

Topography: Flat or slight slope

Soil series: Leon sand

Microclimate: Sunny, moist

Drainage basin: Newport River

Other plant and animal species present: Pinus palustris, Aristida stricta, Lyonia lucida, Ilex glabra

Name of Species: Asclepias pedicellata

Species legal status: Endangered peripheral

Number of populations on site: Unknown

Number of individuals per population: Unknown

Size or maturity of individuals: Flowering

Disturbance or threats to population: Frequent ground fires probably needed

Habitat characteristics:

Vegetation association: Pinus palustris/Aristida stricta

Topography: Gently sloping

Soil series: Leon sand

Microclimate: Suny to semi-shaded, dry

Drainage basin: Newport River

Name of Species: Calamovilfa brevipilis (Riverbank sandreed)

Species legal status: Threatened throughout

Number of populations on site: Unknown: reported by Snyder, 1973

Number of individuals per population: Unknown

Size or maturity of individuals: Unknown

Disturbance or threats to population: May need frequent fire

Habitat characteristics:

Vegetation association: Probably savannah-pocosin ecotone and low pocosin.

Topography: Flat to gently sloping

Soil series: Leon sand

Microclimate: Sunny, moist to dry?

Drainage basin: Newport River

Name of Species: Dionaea muscipula (Venus fly trap)

Species legal status: Threatened endemic, exploited

Number of populations on site: 5 to 10

Number of individuals per population: 5 to 200+

Size or maturity of individuals: Flowering and fruiting

Disturbance or threats to population: Frequent fire is needed. Some plants were dug near Millis Road

Habitat characteristics:

Vegetation association: Savannah-pocosin ecotone

Topography: Slight slope

Soil series: Murville sand, Leon sand

Microclimate: Sunny, moist

Drainage basin: Newport River

Other plant or animal species present: Pinus serotina, Lyonia lucida, Sarracenia flava, Sarracenia purpurea

Name of Species: Sarracenia rubra (Sweet pitcher plant)

Species legal status: Threatened throughout, exploited

Number of populations on site: Two seen (one marginal to site)

Number of individuals per population: About 10

Size or maturity of individuals: Had not flowered this year

Disturbance or threats to population: Would probably benefit from frequent fire

Habitat characteristics:

Vegetation association: Low pocosin, and ecotonal between savannah and Millis Swamp

Topography: Plants were on a hummock of Sphagnum

Soil series: Leon and Murville sand

Microclimate: Sunny, moist

Drainage basin: Newport River

Other plant and animal species present: Sphagnum

Other rare species that might occur on tract:

Lysimachia asperulaefolia (Endangered endemic). Found by Snyder, 1977, in the general area and possibly within this tract.

Solidago pulchra (Endangered endemic). Tract is within range of species.

Fothergilla gardenii (Threatened peripheral). Occurs less than a mile from this tract.

Notable species on the tract, although ont endangered or threatened:

Pinguicula pumila. Found on tract in 1977 (Snyder, 1978, and personal communication with Wilson, 1977). This is northernmost locality at which this species has been found.

e. Summary - Endangered and Threatened Species - Animals

Name of Species: Red-cockaded woodpecker

Species legal status: Endangered (Federal)

Number of populations on site: 2 or 3

Number of individuals per population: Approx. 3

Size or maturity of individuals: Breeding (at least one nest) for the last few years

General vigor of population: Population appears stable

Disturbance or threats to population: Potential of loss of mature timber on site

Habitat characteristics:

Vegetation association: primarily Pinus palustris/Aristida

Drainage basin: Newport River

Other plants and animals species present: Dependent on mature pines for cavity trees

Name of Species: Red-shouldered hawk

Species legal status: Threatened

Number of populations on site: One

Number of individuals per population: Approx. 3

Tract is a feeding area for individuals that apparently nest in Peak Swamp

Name of Species: Bachman's sparrow

Species legal status: Threatened

Number of individuals on site: 10 to 20 in 1979, fewer in 1980

Size or maturity of individuals: Breeding, young seen in 1980

Disturbance or threats to population: Fire needed to suppress subcanopy and shrub layers and provide thick grass cover

Habitat characteristics:

Vegetation association: Pinus palustris/Aristida stricta

Drainage basin: Newport River

Other plants and animals species present: thick Aristida cover

Other rare species that might occur on tract:

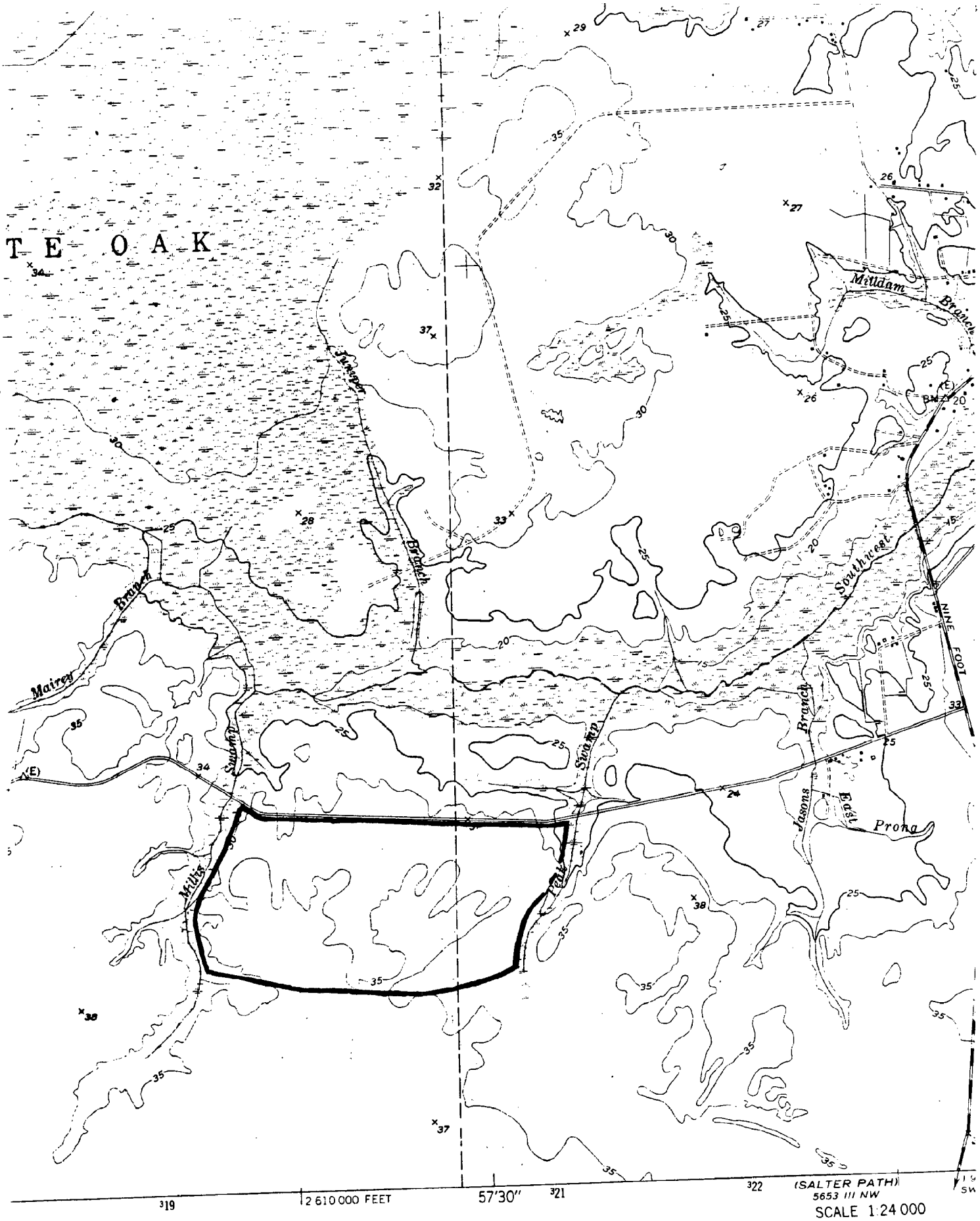
Eastern diamondback rattlesnake (Endangered). We know of no definite records for this tract, but there are records for the general area. Fussell found a dead individual on Millis Road ca. 2 miles WSW of tract in 1978. Also, a skin is in the Croatan Ranger Station that was killed about 10 years ago along Millis Road.

Notable species on the tract, although not endangered or threatened:

Henslow's sparrow. Winter resident on tract. Considered to be of special concern status for North Carolina. Species is decreasing appreciably throughout the United States.

Reference:

Cooper, John et al. 1975. Endangered and Threatened Plants and Animals of North Carolina. N.C. Museum of Natural History Symposium.



MAP 9: MILLIS ROAD LONGLEAF PINE SAVANNAH NATURAL AREA
(from Masontown Quadrangle)

MASTER SPECIES LIST	FLORA
Aceraceae	Acer rubrum
Apiaceae	Centella asiatica
	Eryngium integrifolium
	Oxypolis ternata
Aquifoliaceae	Ilex cassine var. myrtifolia
	Ilex coriacea
	Ilex glabra
Asclepiadaceae	Asclepias pedicellata
Asteraceae	Aster linariifolius
	Aster paludosus
	Aster tortifolius
	Balduina uniflora
	Carphephorus bellidifolius
	Carphephorus tomentosus
	Coreopsis angustifolia
	Eupatorium leucolepis
	Eupatorium recurvans
	Erigeron vernus
	Helianthus angustifolius
	Heterotheca nervosa
	Liatris graminifolia
	Liatris spicata var. resinosa
	Marshallia graminifolia
	Pterocaulon pycnostachyum
	Solidago fistulosa
	Solidago stricta
	Trilisa odoratissima
	Trilisa paniculata
Blechnaceae	Woodwardia virginica
Burmanniaceae	Burmannia biflora
Clethraceae	Clethra alnifolia
Convolvulaceae	Cuscuta compacta
Cyperaceae	Carex walteriana
	Eriophorum virginicum
	Fimbristylis autumnalis
	Fuirena squarrosa
	Rhynchospora cephalanthus
	Rhynchospora chalarocephala
	Rhynchospora chapmanii
	Rhynchospora cilieris
	Rhynchospora fascicularis
	Rhynchospora pallida
	Rhynchospora plumosa
	Scleria spp.

Diapensiaceae	Pyxidanthera barbulata
Dionaeaceae	Dionaea muscipula
Droseraceae	Drosera capillaris Drosera intermedia
Eriocaulaceae	Eriocaulon decangulare Lachnocaulon minus
Ericaceae	Lyonia ligustrina Lyonia lucida Lyonia mariana Vaccinium atrococcum Vaccinium corymbosum Vaccinium crassifolium Vaccinium tenellum Zenobia pulverulenta
Euphorbiaceae	Cnidoscolus stimulosus
Fabaceae	Desmodium tenuifolium Galactia regularis
Fagaceae	Quercus incana Quercus laevis
Gentianaceae	Bartonia verna Bartonia virginica Sabatia difformis
Haemodoraceae	Lachnanthes caroliniana
Hypericaceae	Hypericum reductum Hypericum stans
Iridaceae	Iris verna
Juncaceae	Juncus biflorus Juncus dichotomus Juncus scirpoides
Lamiaceae	Pycnanthemum flexuosum
Lauraceae	Persea borbonia Sassafras albidum
Linaceae	Linum striatum
Lentibulariaceae	Pinguicula pumila Utricularia subulata
Liliaceae	Aletris farinosa Lilium catesbaei Smilax bona-nox Smilax laurifolia

	Tofieldia glabra
	Tofieldia racemosa
	Zigadenus densus
	Zigadenus glaberrimus
Loganiaceae	Celsemium sempervirens
Lycopodiaceae	Lycopodium alopecuroides
Magnoliaceae	Magnolia virginiana
Melastomataceae	Rhexia alifanus
	Rhexia lutea
	Rhexia mariana
	Rhexia petiolata
Myricaceae	Myrica cerifera
	Myrica cerifera var. pumila
	Myrica heterophylla
Orchidaceae	Calopogon pallidus
	Calopogon pulchellus
	Cleistes divaricata
	Habenaria blephariglottis
	Habenaria ciliaris
	Habenaria cristata
Osmundaceae	Osmunda cinnamomea
Pinaceae	Pinus palustris
	Pinus serotina
Poaceae	Andropogon scoparius
	Andropogon virginicus
	Aristida stricta
	Arundinaria gigantea
	Ctenium aromaticum
	Panicum portoricense
	Panicum virgatum
	Panicum spp.
	Tridens flavus
Polygalaceae	Polygala cruciata
	Polygala hookeri
	Polygala lutea
Primulaceae	Lysimachia loomsii
Pteridaceae	Pteridium aquilinum
Rosaceae	Sorbus arbutifolia
Sarraceniaceae	Sarracenia flava
	Sarracenia purpurea
	Sarracenia rubra

Scrophulariaceae	Agalinis linifolia
	Agalinis obtusifolia
	Agalinis setacea
	Agalinis virgata
	Gratiola pilosa
	Seymeria cassioides
Sphagnaceae	Sphagnum spp.
Theaceae	Gordonia lasianthus
Xyridaceae	Xyris caroliniana
	Xyris sp.

In this "fall" list, we include species we remember seeing on previous occasions.

MASTER SPECIES LIST FAUNA

Amphibians

Oak toad
Southern toad
Southern cricket frog
Green treefrog
Pine woods treefrog
Squirrel treefrog
Gray treefrog
Little grass frog
Southern leopard frog
Eastern narrowmouth toad

(There is a small borrow pond at the western edge of the tract where most of the amphibians are found.)

Reptiles

Eastern mud turtle
Eastern box turtle
Carolina anole
Six-lined racerunner
Eastern glass lizard
Black racer
Eastern king snake
Redbelly water snake
Rough green snake
Timber rattlesnake

(A skin of a Diamondback rattlesnake is hanging in the Forest Service ranger station that was killed along Millis Road. Others may be in this area. This snake is endangered.)

Birds

P = permanent resident
S = summer resident
W = winter resident
I = irregular visitant

Turkey vulture I
Black vulture I
Sharp-shinned hawk W
Red-tailed hawk I
Red-shouldered hawk P
American kestrel W
Bobwhite P
Mourning dove P
Screech owl P
Great horned owl P
Barred owl P
Chuck-will's-widow S
Common nighthawk S
(bred in 1980)
Common flicker P
Pileated woodpecker P
Red-bellied woodpecker P
Red-headed woodpecker P
Yellow-bellied sapsucker W
Hairy woodpecker P
Downy woodpecker P
Red-cockaded woodpecker P
Eastern kingbird S
Great crested flycatcher
Eastern phoebe W
Eastern wood peewee S
Blue jay P
Common crow P
Carolina chickadee P
Tufted titmouse P
Red-breasted nuthatch I
Brown-headed nuthatch P
Brown creeper W
House wren W
Winter wren W
Carolina wren P
Short-billed marsh wren W
Gray catbird P
Brown thrasher P
American robin W
Hermit thrush W
Eastern bluebird P
Golden-crowned kinglet W
Ruby-crowned kinglet W
Cedar waxwing W
White-eyed vireo S
Yellow-rumped warbler W
Yellow-throated warbler S
Pine warbler S
Prairie warbler S

Birds (cont.)

Palm warbler W	Rufous-sided towhee P
Common yellowthroat P	Savannah sparrow W
Eastern meadowlark P	Henslow's sparrow W
Redwinged blackbird P?	Bachman's sparrow P
Cardinal P	Dark-eyed junco W
Blue grosbeak S	Chipping sparrow W
Indigo bunting S	Field sparrow W
Purple finch I	White-throated sparrow W
Pine siskin I	Swamp sparrow W
American goldfinch W	Song sparrow W

Mammals

Opossum	Eastern cottontail
Raccoon	Whitetail deer

(These are the only species we recorded; several others undoubtedly occur).

References

Beland, J. 1971. Timber management practices for red-cockaded woodpeckers on federal lands. In: Thompson, R. 1971. The ecology and management of the red-cockaded woodpecker. Proceedings of a symposium at Okefenokee National Wildlife Refuge, Folkston, Georgia, May 26-27, 1971.. U.S. Dept. of the Interior, Bureau of Sport Fisheries and Wildlife.

Mixon, R.B. & O,H. Pilkey. 1976. Reconnaissance geology of the submerged and emerged coastal plain province. Cape Lookout Area N.C. Geol. Survey Prof. Paper 859. U.S. Govt. Printing Office. Washington, D.C.

Snyder, James. 1978. Analysis of coastal plain vegetation. Croatan National Forest, North Carolina. Veröff, Geobot. Inst. ETH Stiftung Rübel, Zürick 69. Heft (1980) 40-113. (Based on Masters Thesis, UNC Chapel Hill.)

Patsy Pond Natural Area

Name of Area: Patsy Pond*

Location: Carteret County, North Carolina; 0.5 miles due N of NC 24, 12 mi. SE Swansboro 34°43'35" N, 76°57'44" W; Salter Path, N.C. 7½', 1949; Atlantic Coastal Plain; Outer Coastal Plain. See Maps 10-11.

Elevation: 20'; 6.1 m

Size: ca. 70 Acres

Ownership: Croatan National Forest

Administration: Croatan National Forest

Land Use: Hunting, recreation, timber

Dangers to Integrity: Damage done to area by vehicles

Significance and Protection Priority: Appears to be highly significant; Site is in some jeopardy

Reasons for Priority Rating: Area offers excellent examples of plant communities and zonation. Many rare and endangered or threatened plants of North Carolina (Hardin et al) are found here: Eleocharis robbinsii, Litsea aestivalis, Ludwigia linifolia, Myriophyllum laxum, Ploygonella articulata, Polygonum hirsutum, Rhynchospora inundata, and Utricularia olivacea. Moreover, a plant new to the State of North Carolina occurs here---Sagittaria isoetiformis. The area is also unique geologically.

Management Recommendations: Natural Area should be managed for endangered and threatened species preservation, for unique community preservation, for scientific research, and as an education resource. Some periodic control burning should be done. Vehicular traffic (including motorcycles) should be stopped.

Data Sources: None.

General Scientific References: None. See bibliography after discussion.

General Documentation and Authentication: Area analyzed in the Fall of 1976. Specimens deposited in the NCU Herbarium by R. David Whetstone and Deborah Otte in 1977. Complete documentation available from authors.

*Contributed by Deborah K. Strady Otte and R. David Whetstone, Department of Botany, University of North Carolina at Chapel Hill (1979).

NATURAL AREA DIVERSITY SUMMARY

Climate: A. Mesothermal; AA. Warm Temperate. B. Cool, Moist; BB. Moderately hot & Moderately warm, Moderately wet & Moderately dry. C. Very long; CC. Similar to regional, Extremely dry to Extremely wet.

Soils: A. Entisol; AA. Psamment. B. Quartzipsamment; BB. Typic quartzipsamment, BB. Aquic quartzipsamment. C. Thermic, uncoated typic quartzipsamment, C. Thermic, uncoated aquic quartzipsamment; CC. Leon. A. Histosol; AA. Fibrist, AA. Saprist. B. Medifibrist, B. Sphagnofibrist, B. Medisaprist; BB. Typic medifibrist, BB. Limnic sphagnofibrist, BB. Lemnic medisaprist. C. Thermic typic medifibrist, C. Sandy, coprogenous, euic, thermic limnic sphagnofibrist, C. Coprogenous, euic, thermic limnic medisaprist; CC. Peat, CC. Muck.

Geology: A. Pleistocene, Sedimentary; AA. Deposit. B. Flanner Beach Formation; BB. Siliceous. C. Highly acid; CC. Quartz sand.

Hydrology: A. Emergent wetland, A. Vascular aquatic, A. Floating-leaved aquatic; AA. Seasonally to permanently flooded. B. Fresh; BB. Acid. C. Unconsolidated sediments, C. Organic bottom; CC. Siliceous, CC. Carbonaceous.

Hydrography: A. Broad Creek & Sanders Creek which drain into Bogue Sound, Palustrine; AA. Natural impoundment ponds. B. Patsy Pond and associated ponds, Interaqueous depths and substrates. C. Smooth, C. Hummocks; CC. Open, variously exposed, nearly level to gently sloping slopes.

Topography: A. Ridge; AA. Old beach ridge system. B. Patsy Pond Area; BB. Sand ridges, BB. Constant slopes, BB. Flats, BB. Seepage zone. C. Gently undulating, C. Smooth; CC. Open, variously exposed, nearly level to gently sloping slopes.

DISCUSSION

The Patsy Pond Natural Area is a series of naturally impounded ponds on the Outer Coastal Plain of North Carolina. These ponds occur in an area which is an old beach ridge system of Pleistocene age (Newport sand member of the Flanner Beach Formation). The Newport sands consist primarily of well-sorted sands believed to constitute barrier deposits emplaced on the downdrift side of an ancestral Neuse River (Mixon and Pilkey, 1976). Near the study area, this member has been shown to overlie a layer of bluish-gray clayey sand and abundant molluscan and ostracod fauna (indicative of Pleistocene age). The study site seems to be on an erosional slope of a broad sand ridge. Wind, sheet and stream erosion has produced very gently sloping sand ridges and sand flats. The streams flow into either the West Prong of Broad Creek or the East Prong of Sanders Creek. The ponds appear to be products of natural impounding of old streams.

The vegetation of the area provides excellent examples of community types and their zonation. Definite relationships exist between these community types, their substrates, and their moisture. These relationships are depicted in Table 4.

A noteworthy feature is the occurrence of the Mixed Herb Community Type, a unique zone varying from mesic sand to wet-hydric peat. The sandy areas are associated with openings in the Scrub-Shrub System border. We believe that fire has opened up these sandy areas by burning the Scrub-Shrub and the accumulated peat off the soil surface. A broad overlap of species occurs from mesic to wet-hydric, and from sand to peat. Other species appear to be restricted to micro-edaphic features. The wetter areas, which are more resistant to burning, conceivably are seed reserviors for herbs associated with this Community Type. Several noteworthy species that occur here are listed under Marsh Herb System in Table 5.

In addition, the area harbors a complex of plants referrable to Ilex cassine. Intraspecific taxa (Radford et at., 1968) have been recognized as species by some authors (e.g., Ilex myrtifolia Walter). Both varieties (sensu Radford et al., 1968) occurring here are distinctive, however, many intermediates exist, hence, providing a good taxonomic study site.

The conservation of Patsy Pond Natural Area is quite justifiable. The general reasons are:

1) the presence of several endangered and threatened species (Table 5);
2) the presence of a unique assemblage of plants (i.e., Mixed Herb Community Type);
3) the presence of a unique geological features (i.e., natural ponds on the Outer Coastal Plain of North Carolina which are not Carolina Bays);
4) the historical significance of the area as perhaps being a Neuse River Paleochannel (Mixon and Pilkey, 1976);
5) and the added feature of the natural area as an "outdoor classroom: for taxonomic, ecological, geological, and pedological studies.

Certainly Patsy Pond Natural Area constitutes a valuable natural heritage which deserves recognition and conservation for both ourselves and our posterity.

REFERENCES

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Radford, A. E., et al. 1968. Manual of the Vascular Flora of the Carolinas. The University of North Carolina Press, Chapel Hill.

Small, J.K. 1972. Manual of the Southeastern Flora. 2 Vol. (facsimile reprint of the 1933 edition). Hafner Pub. Co., New York.

U.S.G.S. 1970. The National Atlas of the United States of America. U.S. Department of Interior, Washington, D.C.

MAP 10: PATSY POND NATURAL AREA
(taken form USGS Topographic Map, Salter Path Quadrangle, 7½', 1949, 1:24,000)

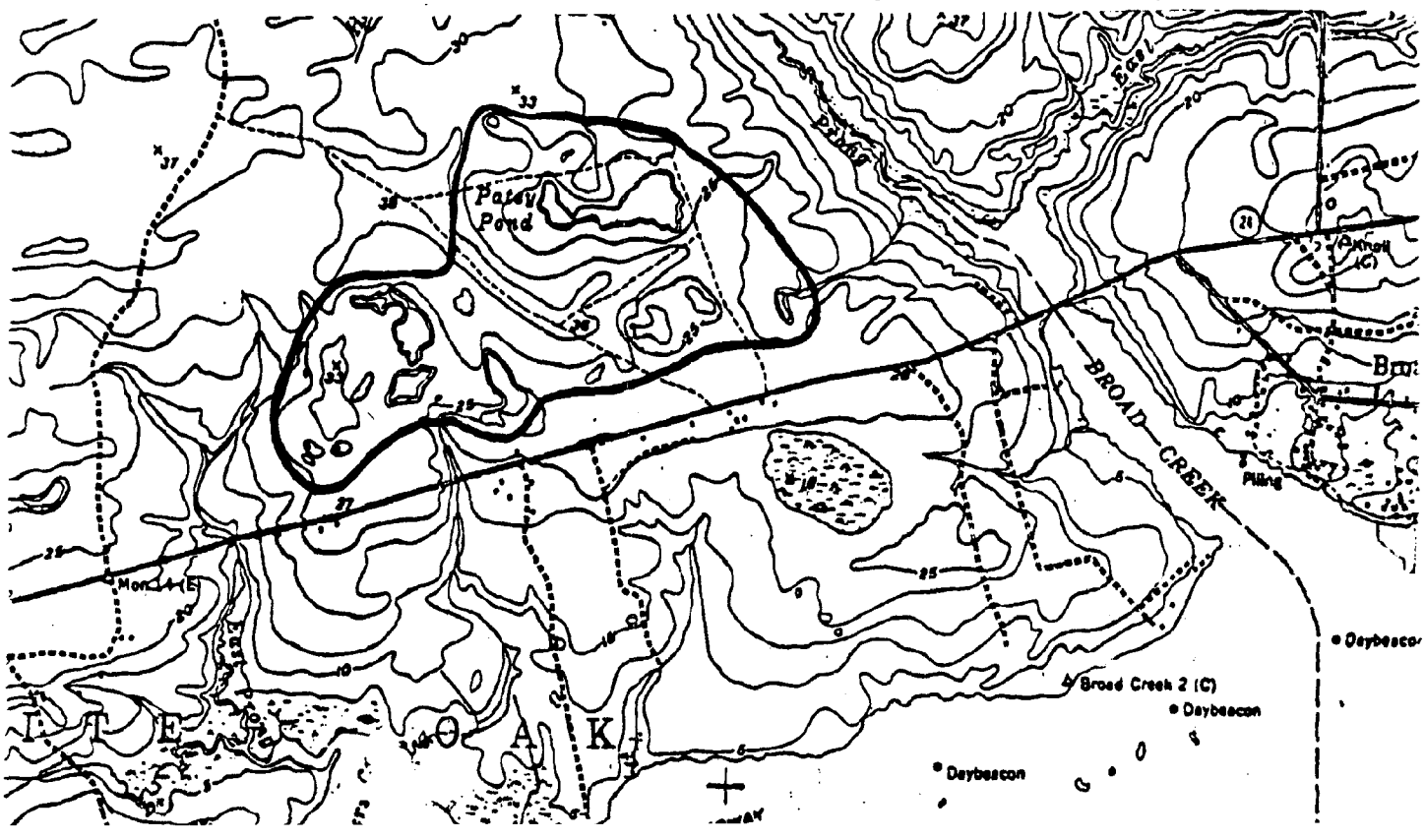


Table 4. Community types: edaphic and moisture relations.

VEGETATION SYSTEM	COMMUNITY TYPES	SOIL FAMILY	WATER	MOISTURE CLASS
VASCULAR AQUATIC	Utricularia olivacea Myriophyllum laxum Nuphar luteum Nymphaea odorata Nymphoides cordata Eleocharis equisetoides-Nuphar luteum Rhynchospora inundata-Nuphar luteum	Coprogenous, euic, thermic limnic medisaprist	60 cm to 2.5 m deep (probably does get deeper)	Hydric
	Panicum hemitomon	Euic, thermic typic medifibrist to sandy, coprogenous, euic, thermic limnic sphagnofibrist	5-20 cm deep	Hydric
MARSH GRASS	Panicum hemitomon	Sandy, coprogenous, euic, thermic limnic sphagnofibrist	Saturated, but usually not in standing water	Wet-hydric to hydric
MARSH HERB	Mixed herbs	Euic, thermic typic medifibrist or thermic, uncoated aquic quartzipsamment	Saturated, water table only 15 cm down	Wet-hydric to mesic
GRASS	Andropogon scoparius	Thermic, uncoated typic quartzipsamment	Water table 45 cm down	Dry-mesic
SCRUB-SHRUB	Cyrilla racemiflora-Lyonia lucida-Vaccinium atrococcum Litsea aestivalis-Lyonia lucida	Thermic, uncoated typic quartzipsamment	Water table 90 cm down	Dry-mesic
WOODLAND	Pinus palustris-Quercus laevis-Gaylussacia frondosa-dumosa	Thermic, uncoated typic quartzipsamment	Water table much further down	Very dry-xeric

Table 5. Endangered and threatened species.

SPECIES	E & T STATUS*	VEGETATION SYSTEM
Burmannia biflora	Infrequent Throughout	MARSH HERB
Eleocharis robbinsii	Endangered Disjunct	MARSH HERB
Eragrostis elliottii	Infrequent Peripheral	WOODLAND
Litsea aestivalis	Endangered Peripheral	SCRUB-SHRUB
Ludwigia linifolia	Endangered Disjunct	MARSH HERB
Myriophyllum laxum	Threatened Throughout	VASCULAR AQUATIC
Nymphoides cordata	Infrequent Peripheral	VASCULAR AQUATIC
Panicum spretum	Infrequent Peripheral	MARSH HERB
Polygonella articulata	Endangered Disjunct	WOODLAND
Polygonum hirsutum	Endangered Throughout	MARSH HERB
Rhynchospora inundata	Infrequent Throughout	VASCULAR AQUATIC
Sagittaria isoetiformis	Threatened Peripheral	VASCULAR AQUATIC
Utricularia olivacea	Threatened Throughout	VASCULAR AQUATIC

*See Table 1 on page 26 for a complete list of E & T categories.

COMMUNITY DIVERSITY SUMMARY
PATSY POND

Woodland System — Pine/oak/heath ridges, slopes, and flats

Large, excurrent, evergreen trees, large, deliquescent, deciduous subcanopy & typical dwarf to tall dwarf, rhizomatous, deciduous shrubs — Coniferales/Fagales/Ericales

PINUS PALUSTRIS/QUERCUS LAEVIS/GAYLUSSACIA FRONDOSA-G. DUMOSA
Pinus palustris/Quercus laevis/Gaylussacia frondosa-G. dumosa

SOILS: A. Entisol; AA. Psamment. B. Quartzipsamment; BB. Typic quartzipsamment. C. Thermic, uncoated typic quartzipsamment; CC. Leon.
Topsoil: 0-86 cm, light gray, fine to medium sand, pH 4.0.
Subsoil: 86 cm +, dark reddish brown, fine to medium sand, pH 4.0 (hardpan).
GEOLOGY: A. Pleistocene, Sedimentary; AA. Deposit. B. Flanner Beach Formation; BB. Siliceous. C. Highly acid; CC. Quartz sand.
TOPOGRAPHY: A. Ridge; AA. Old beach ridge system. B. Patsy Pond Area; BB. Sand ridges, BB. Constant slopes, BB. Flats. C. Gently undulating, C. Smooth; CC. Open, variously exposed, nearly level to gently sloping slopes.

CANOPY: Height, DBH, and age not determined.
DOMINANTS: Large, excurrent, evergreen trees.

CANOPY ANALYSIS

Species	I.V.	Rel. Den.	Rel. Dom.	Rel. Freq.
Pinus palustris	189.98	73.44%	77.73%	38.81%
Quercus laevis	63.96	20.31	19.84	23.81
Q. virginiana	23.98	3.13	1.80	19.05
Q. laurifolia	22.82	3.13	0.64	19.05

# of Points 16 d 19.02 ft # of individuals/acre 120.41

CANOPY SPECIES PRESENT, BUT NOT IN ANALYSIS:
Ilex opaca, Liquidambar styraciflua, Pinus taeda, Quercus X blufftonensis, Q. falcata, Q. margaretta, and Sassafras albidum.

SUBCANOPY: Height, DBH, and age not determined.
DOMINANTS: Large, deliquescent, deciduous trees.
SUBCANOPY ANALYSIS: Included in quarterpoints for the canopy. See table above.

SHRUB LAYER DOMINANTS: Typical dwarf to tall dwarf, rhizomatous, deciduous shrubs.
SHRUB ANALYSIS: See Table 6.
SHRUB SPECIES PRESENT, BUT NOT IN ANALYSIS:
TYPICAL DWARF SHRUBS-Hypericum reductum, NORMAL SHRUBS-Lyonia lucida, Myrica heterophylla, TALL SHRUBS-Castanea pumila var. ashei, Crataegus sp., GIANT SHRUBS-Vaccinium arboreum.

HERB LAYER DOMINANTS: None present.
HERB ANALYSIS: See Table 6.
HERB SPECIES PRESENT, BUT NOT IN ANALYSIS:
MEDIUM FORBS-Lachnocaulon minus, Monotropa uniflora, Stipulicida setacea, TALL FORBS-Cirsium repandum, Cnidoscolus stimulosus, Eupatorium recurvans, Gnaphalium obtusifolium, Liatris secunda, MEDIUM GRASSES-Panicum portoricense, TALL GRASSES-Andropogon scoparius, A. virginicus, Eragrostis elliottii, Sporobolus poirettii, Tridens flavus, TALL FERN Pteridium aquilinum.

Table 6

SHRUB ANALYSIS:

Species	1 C.S	2 C.S	3 C.S	4 C.S	5 C.S	6 C.S	7 C.S	8 C.S	9 C.S	10 C.S	11 C.S	12 C.S	13 C.S	14 C.S	15 C.S	16 C.S
TYPICAL DWARF SHRUBS																
Gaylussacia dumosa	5.4	1.4	-.-	1.3	1.3	3.3	4.3	3.3	2.3	2.3	1.3	5.3	2.3	5.3	2.3	2.3
Vaccinium crassifolium	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	2.4
V. tenellum	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.2
ALL DWARF SHRUBS																
Gaylussacia frondosa	-.-	-.-	-.-	5.3	3.3	1.3	3.3	1.3	1.3	1.3	3.3	3.3	-.-	1.3	-.-	5.3
Vaccinium vacillans	-.-	+.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
NORMAL SHRUBS																
Lyonia mariana	2.1	-.-	-.-	-.-	-.-	1.3	-.-	-.-	-.-	-.-	2.3	-.-	-.-	-.-	1.3	-.-
Myrica cerifera var. pumila	-.-	-.-	-.-	2.3	1.3	2.3	2.3	5.3	5.3	2.3	1.3	1.3	1.3	1.3	1.3	2.3
TALL SHRUBS																
Ilex glabra	-.-	-.-	-.--	-.-	2.3	-.-	2.3	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Rhus copallina	-.-	-.-	-.-	-.-	+.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-

# of Relevés 16 Relevé Size 3 m X 3 m

HERB ANALYSIS:

Species	1 C.S	2 C.S	3 C.S	4 C.S	5 C.S	6 C.S	7 C.S	8 C.S	9 C.S	10 C.S	11 C.S	12 C.S	13 C.S	14 C.S	15 C.S	16 C.S
TALL GRASSES																
Aristida stricta	4.3	5.3	1.3	1.3	2.3	-.-	3.3	2.3	2.3	2.3	4.3	2.3	1.3	2.3	1.3	3.3
TALL FORBS																
Aster linariifolius	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Carphephorus bellidifolius	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.2	-.-	+.1	-.-	-.-	-.-	-.-
Heterotheca adenolepis	-.-	-.-	1.1	-.-	-.-	-.-	-.-	-.-	1.1	1.1	-.-	-.-	-.-	-.-	-.-	-.-
Polygonella articulata	+.1	1.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Sericocarpus bifoliatus	-.-	-.-	-.-	-.-	-.-	-.-	1.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Tragia urens	-.-	-.-	-.-	-.-	+.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-

# of Relevés 16 Relevé Size 1 m X 1 m

ECOLOGICAL CHARACTERIZATION:

Vegetationally--Coniferalean-Fagalean-Ericalean Gymnosperm Woodland System with a canopy of large, excurrent, evergreen trees, a subcanopy of large, deliquescent, deciduous trees, and a shrub layer of typical dwarf to tall dwarf, rhizomatous, deciduous shrubs. Climatically--Warm, temperate mesothermal climate: Cool, moist yearly, moderately hot and moderately wet in the summer (July), moderately warm and moderately dry in the winter (January) and with a very long Frost Free season. Pedologically--Leon, thermic, uncoated typic quartzipsamment soil. Geologically--Highly acid, siliceous, Flanner Beach, unconsolidated, quartz sand deposit. Topographically--Open, variously exposed, nearly level to gently sloping, constant slopes with a gently undulating surface and open, variously exposed, nearly level flats with a smooth surface on an old beach ridge system. Temporally and spatially--Pyroclimax stage of a psammosere in the Sea Island Section of the Atlantic Coastal Plain.

COMMUNITY REFERENCES: All community analyses in this study have no specific references. See bibliography after discussion. Throughout the remainder of the paper this section will be omitted from the summary.

COMMUNITY DOCUMENTATION: Same as General Documentation throughout the study.

COMMUNITY DIVERSITY SUMMARY
PATSY POND

Scrub-Shrub System — Shrub zone

Normal to tall, rhizomatous, deciduous and evergreen shrubs — Ericales OR Magnoliales/Ericales

CYRILLA RACEMIFLORA/LYONIA LUCIDA/VACCINIUM ATROCOCCUM
Cyrilla racemiflora

OR

LITSEA AESTIVALIS/LYONIA LUCIDA
Litsea aestivalis

SOILS: A. Entisol; AA. Psamment. B. Quartzipsamment; BB. Typic quartzipsamment. C. Thermic, uncoated typic quartzipsamment; CC. Leon.
Topsoil: 0-70 cm, light gray, fine to medium sand, pH 3.9.
Subsoil: 70 cm +, dark reddish brown, fine to medium sand, pH 3.9 (hardpan).
GEOLOGY: A. Pleistocene, Sedimentary; AA. Deposit. B. Flanner Beach Formation; BB. Siliceous. C. Highly acid; CC. Quartz sand.
TOPOGRAPHY: A. Ridge; AA. Old beach ridge system. B. Patsy Pond Area; BB. Seepage zone. C. Gently undulating; CC. Open, variously exposed, nearly level slopes.

CANOPY: None present.
SUBCANOPY: None present.

SHRUB LAYER DOMINANTS: Normal to tall, rhizomatous, deciduous and evergreen shrubs.
SHRUB ANALYSIS: See Table 7.

ECOLOGICAL CHARACTERIZATION:

Vegetationally--Ericalean or Magnolialean-Ericalean Scrub-Shrub System with tall to normal, rhizomatous, deciduous or evergreen shrubs. Climatically--Warm, temperate mesothermal climate: Cool, moist yearly, moderately hot and moderately wet in the summer (July), moderately warm and moderately dry in the winter (January) and with a very long Frost Free season. Pedologically--Leon, thermic, uncoated typic quartzipsamment soil. Geologically--Highly acid, siliceous, Flanner Beach, unconsolidated quartz sand deposit. Topographically--Open, variously exposed, nearly level seepage zones with a gently undulating surface on an old beach ridge system. Temporally and spatially--Pyroclimax stage of a psammosere in the Sea Island Section of the Atlantic Coastal Plain.

Table 7

SHRUB ANALYSIS:

Species	1 C.S	2 C.S	3 C.S	4 C.S	5 C.S	6 C.S	7 C.S	8 C.S	9 C.S	10 C.S	11 C.S	12 C.S	13 C.S	14 C.S
NORMAL SHRUBS														
Litsea aestivalis	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.3	4.3	5.3	-.-	3.3
Lyonia lucida	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	1.3	4.3	5.3	3.3	4.3
Myrica cerifera var. cerifera	-.-	-.-	-.-	-.-	+.3	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Vaccinium atrococcum	3.3	-.-	2.3	-.-	2.3	3.3	2.3	3.3	2.3	5.3	-.-	-.-	5.3	3.3
TALL SHRUBS														
Cyrilla racemiflora	4.3	5.3	5.3	5.3	5.3	4.3	5.3	3.3	2.3	-.-	-.-	-.-	-.-	-.-
Ilex cassine var. myrtifolia	-.-	-.-	2.3	2.3	-.-	-.-	1.3	-.-	-.-	-.-	-.-	1.3	-.-	-.-
I. glabra	-.-	-.-	-.-	-.-	-.-	-.-	+.3	-.-	-.-	+.3	-.-	-.-	-.-	-.-
Sorbus arbutifolia	-.-	-.-	-.-	-.-	-.-	-.-	2.3	-.-	-.-	-.-	-.-	-.-	-.-	-.-

SHRUB SPECIES PRESENT, BUT NOT IN ANALYSIS:
TENDRIL CLIMBERS-Smilax glauca, S. laurifolia, S. rotundifolia, TYPICAL DWARF SHRUBS-Vaccinium crassifolium, NORMAL SHRUBS-Baccharis halimifolia, Lyonia mariana, Myrica heterophylla, TALL SHRUBS-Cephalanthus occidentalis, Ilex cassine var. cassine, I. coriacea, Rhus copallina, GIANT SHRUBS-Arundinaria gigantea, Persea borbonia, TRANSGRESSIVES-Acer rubrum, Ilex opaca, Liquidambar styraciflua, Magnolia grandiflora, M. virginiana, Pinus serotina, Salix caroliniana.

# of Releves 14 Releve Size 3 m X 3 m

COMMUNITY DIVERSITY SUMMARY
PATSY POND

Grass System
Tall, cespitose, deciduous grasses

Grass zone
Poaceae

ANDROPOGON SCOPARIUS
Andropogon scoparius

SOILS: A. Entisol; AA. Psamment. B. Quartzipsamment; BB. Typic quartzipsamment. C. Thermic, uncoated typic quartzipsamment; CC. Leon.
Topsoil: 0-70 cm, light gray, fine to medium sand, pH 3.9.
Subsoil: 70 cm +, dark reddish brown, fine to medium sand, pH 3.9 (hardpan).
GEOLOGY: A. Pleistocene, Sedimentary; AA. Deposit. B. Flanner Beach Formation; BB. Siliceous. C. Highly acid; CC. Quartz sand.
TOPOGRAPHY: A. Ridge; AA. Old beach ridge system. B. Patsy Pond Area; BB. Grass zone. C. Smooth; CC. Open, variously exposed, nearly slopes.

CANOPY: None present.
SUBCANOPY: None present.
SHRUBS: None present.

HERB LAYER DOMINANTS: Tall, cespitose, deciduous grasses.

HERB ANALYSIS:

Species	37 C.S	38 C.S	39 C.S	40 C.S	41 C.S	42 C.S	43 C.S	44 C.S
VERY SMALL HERBS								
Centella asiatica	3.5	2.5	1.5	2.5	2.5	2.5	2.5	4.5
SMALL HERBS								
Drosera capillaris	+.1	+.1	+.1	+.1	+.1	-.-	-.-	-.-
D. intermedia	-.-	+.1	+.1	+.1	1.1	-.-	-.-	-.-
MEDIUM HERBS								
Polygala lutea	-.-	-.-	-.-	-.-	-.-	-.-	1.1	-.-
TALL HERBS								
Rhexia mariana	-.-	-.-	-.-	-.-	+.1	-.-	-.-	-.-
Xyris caroliniana	+.1	+.1	+.1	-.-	+.1	-.-	-.-	-.-
MEDIUM GRASSES								
Eleocharis sp.	3.2	1.2	-.-	1.2	2.2	-.-	-.-	-.-
TALL GRASSES								
Andropogon scoparius	4.2	5.2	5.2	4.2	3.2	5.2	5.2	5.2
A. virginicus	-.-	-.-	-.-	-.-	-.-	-.-	-.-	+.3
Panicum spretum	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.3
Rhynchospora wrightiana	-.-	-.-	-.-	-.-	-.-	1.2	1.2	1.2

HERB SPECIES PRESENT, BUT NOT IN ANALYSIS: TALL HERBS, Eupatorium recurvans.
# of Relevés 8 Releve Size 1 m X 1m

ECOLOGICAL CHARACTERIZATION:

Vegetationally--Poaceous Grass System with tall, cespitose, deciduous grasses. Climatically--Warm, temperate mesothermal climate: Cool, moist yearly, moderately hot and moderately wet in the summer (July), moderately warm and moderately dry in the winter (January) and with a very long Frost Free season. Pedologically--Leon, thermic, uncoated typic quartzipsamment soil. Geologically--Highly acid, siliceous, Flanner Beach, unconsolidated quartz sand deposit. Topographically--Open, variously exposed, nearly level zones with a smooth surface on an old beach ridge system. Temporally and spatially--Pyroclimax stage of a psammosere in the Sea Island Section of the Atlantic Coastal Plain.

COMMUNITY DIVERSITY SUMMARY
PATSY POND

Marsh Herb System
Tall, rhizomatous, deciduous herbs

Mixed herb zone
Mixed herbs

MIXED HERBS
Mixed herbs

SOILS: A. Entisol; AA. Psamment. B. Quartzipsamment; BB. Aquic quartzipsamment. C. Thermic, uncoated aquic quartzipsamment; CC. Undetermined.
Topsoil: 0-40 cm, light gray, fine to medium sand, pH 3.9.
Subsoil: 40 cm +, dark reddish brown, fine to medium sand, pH 3.9 (hardpan).
Topsoil: 0-16 cm, black, peat, pH 4.0.
Subsoil: 16 cm +, light gray, fine to medium sand, pH undetermined.
HYDROLOGY: A. Emergent wetland; AA. Seasonally flooded. B. Fresh; BB. Acid. C. Unconsolidated sediments, C. Organic bottom; CC. Siliceous, CC. Carbonaceous.
HYDROGRAPHY: A. Broad Creek & Sanders Creek which drain into Bogue Sound, Palustrine; AA. Natural impoundment ponds. B. Patsy Pond and associated ponds, Interaqueous zones; BB. Zone. C. Smooth; CC. Open, variously exposed, nearly level slopes.

CANOPY: None present.
SUBCANOPY: None present.
SHRUBS: None present.

HERB LAYER DOMINANTS: Tall, rhizomatous, deciduous herbs.
HERB ANALYSIS: See Table 8.
HERB SPECIES PRESENT, BUT NOT IN ANALYSIS:
MEDIUM HERBS-Bartonia paniculata Polygala lutea, TALL HERBS-Agalinis purpurea, Erigeron vernus, Eriocaulon compressum, Pogonia ophioglossoides, Polygonum hirsutum, Solidago fistulosa, S. tenuifolia, VERY TALL HERBS-Eupatorium capillifolium var. capillifolium, TALL GRASSES-Panicum verrucosum, MEDIUM FERN ALLIES-Lycopodium carolinianum, SMALL MOSSES-Sphagnum sp.

ECOLOGICAL CHARACTERIZATION:

Vegetationally--Mixed Marsh Herb System with tall, rhizomatous, deciduous herbs. Climatically--Warm, temperate mesothermal climate: Cool, moist yearly, moderately hot and moderately wet in the summer (July), moderately warm and moderately dry in the winter (January) and with a very long Frost Free season. Pedologically--Thermic, uncoated aquic quartzipsamment soil or Peat, euic, thermic typic medifibrist soil. Hydrologically--An emergent wetland with a bottom of siliceous unconsolidated sediments or carbonaceous organic material which is seasonally flooded by fresh, acidic water. Hydrographically--A series of natural impoundment ponds of the palustrine system with open, variously exposed, nearly level slopes with a smooth surface and with a drainage system consisting of Broad Creek and Sanders Creek which flow into Bogue Sound. Temporally and spatially--Pioneer stage of a hydropsammosere or a hydrohistosere in the Sea Island Section of the Atlantic Coastal Plain.

Table 8

HERB ANALYSIS	DEEP PEAT							INUNDATED PEAT					SPARSE SPHAGNUM			SAND			
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Species	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S	C.S
VERY SMALL HERBS																			
Centella asiatica	+.5	-.-	+.5	-.-	1.5	-.-	-.-	3.5	1.5	1.5	1.5	-.-	5.5	-.-	5.5	4.5	5.5	5.5	5.5
SMALL HERBS																			
Burmannia biflora	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	+.1
B. capitata	+.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.1
Drosera intermedia	+.1	1.1	-.-	-.-	-.-	2.1	3.1	-.-	-.-	-.-	-.-	+.1	+.1	+.1	-.-	+.1	1.1	1.1	-.-
Viola lanceolata	2.1	-.-	-.-	-.-	-.-	1.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	+.1	+.1	+.1	+.1
MEDIUM HERBS																			
Ludwigia linifolia	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	+.1	1.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
TALL HERBS																			
Eriocaulon compressum	3.2	3.2	3.2	+.2	5.2	5.2	5.2	+.2	1.2	2.2	1.2	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Eupatorium recurvans	-.-	-.-	-.-	-.-	-.-	-.-	-.-	2.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Lachnanthes caroliniana	-.-	2.1	-.-	-.-	2.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Polygala cymosa	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Proserpinaca pectinata	2.1	1.1	2.1	+.1	3.1	3.1	5.1	-.-	-.-	2.1	3.1	2.1	-.-	-.-	+.1	-.-	-.-	-.-	+.1
Rhexia mariana	1.1	+.1	1.1	-.-	-.-	-.-	-.-	1.1	-.-	+.1	1.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Xyris caroliniana	+.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	+.1	1.1	1.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
MEDIUM GRASSES																			
Panicum portoricense	-.-	+.3	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.3	+.3	2.3	-.-	-.-	-.-	-.-	-.-	-.-
TALL GRASSES																			
Andropogon scoparius	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.2	+.2	2.2	1.2	1.2	-.-	-.-	-.-	1.2	1.2	1.2	3.2
A. virginicus	+.3	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Juncus abortivus	-.-	-.-	-.-	-.-	-.-	-.-	-.-	5.1	1.1	3.1	3.1	+.1	-.-	-.-	+.1	-.-	-.-	-.-	-.-
J. dichotomus	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	+.1	-.-	+.1	-.-	-.-	-.-	-.-
Panicum hemitomon	2.5	1.5	-.-	-.-	1.5	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.5	+.5	-.-	-.-	-.-	-.-
P. spretum	+.3	2.3	2.3	-.-	-.-	-.-	-.-	-.-	1.3	2.3	-.-	-.-	-.-	1.3	1.3	1.3	2.3	1.3	2.3
P. virgatum	-.-	-.-	-.-	1.1	-.-	2.1	2.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	+.1	-.-	-.-	-.-	-.-
Rhynchospora wrightiana	+.2	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	5.2	-.-	-.-	-.-	-.-	-.-	-.-
Scleria reticularis	+.2	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.1	+.1	-.-	-.-	-.-	-.-
Tridens flavus	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	2.2
MEDIUM FERN ALLIES																			
Lycopodium appressum	-.-	+.5	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	2.5	2.5	2.5	2.5
ROOTED-FLOATING LEAFED AQUATICS																			
Nymphoides cordata	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	1.2	-.-	-.-	-.-	-.-	-.-	-.-	-.-
FREE FLOATING LEAFY AQUATICS																			
Utricularia olivacea	-.-	-.-	-.-	-.-	-.-	-.-	-.-	5.1	5.1	1.1	1.1	1.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-
U. purpurea	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	+.1	-.-	+.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-
EMERGED STOLONIFEROUS AQUATICS																			
Utricularia juncea	-.-	-.-	-.-	-.-	-.-	-.-	-.-	2.1	1.1	1.1	1.1	1.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-

ADD Drosera capillaris, a small herb, with C.S values of 1.1 in releves 33 - 36.

# of Releves 19

Releve Size 1 m X 1 m

COMMUNITY DIVERSITY SUMMARY
PATSY POND

Marsh Grass System
Tall, stoloniferous, deciduous grasses

Panic grass marsh
Poaceae

PANICUM HEMITOMON
Panicum hemitomon

SOILS: A. Histosol; AA. Fibrist. B. Sphagnofibrist; BB. Limnic sphagnofibrist. C. Sandy, coprogenous, euic, thermic limnic sphagnofibrist; CC. Peat.
Topsoil: 2.8 m, black, peat, pH 5.5.
Subsoil: light gray, fine to medium sand, pH undetermined.
HYDROLOGY: A. Emergent wetland; AA. Seasonally flooded. B. Fresh; BB. Acid. C. Organic bottom; CC. Carbonaceous.
HYDROGRAPHY: A. Broad Creek & Sanders Creek which drain into Bogue Sound, Palustrine; AA. Natural impoundment ponds. B. Patsy Pond and associated ponds, Interaqueous zones; BB. Flat. C. Smooth, C. Hummocks; CC. Open, variously exposed, nearly level slopes.

CANOPY: None present.
SUBCANOPY: None present. One transgressive of Pinus serotina present.
SHRUBS: None present.

HERB LAYER DOMINANTS: Tall, stoloniferous, deciduous grasses.
HERB ANALYSIS: Observation only. Cover is almost 100% Panicum hemitomon.
HERB SPECIES ALSO PRESENT:
TALL HERBS-Pogonia ophioglossoides, EMERGENT STOLONIFEROUS AQUATICS-Utricularia sp.

ECOLOGICAL CHARACTERIZATION:

Vegetationally—Poaceous Marsh Grass System with tall, stoloniferous, deciduous grasses. Climatically--Warm, temperate mesothermal climate: Cool, moist yearly, moderately hot and moderately wet in the summer (July), moderately warm and moderately dry in the winter (January) and with a very long Frost Free season. Pedologically--Peat, sandy, coprogenous, euic, thermic limnic sphagnofibrist soil. Hydrologically--An emergent wetland with a bottom of carbonaceous organic material which is seasonally flooded by fresh, acidic water. Hydrographically--A series of natural impoundment ponds of the palustrine system with open, variously exposed, nearly level flats with a smooth surface or with hummocks and with a drainage system consisting of Broad Creek and Sanders Creek which flow into Bogue Sound. Temporally and spatially--Pioneer stage of a hydrohistosere in the Sea Island Section of the Atlantic Coastal Plain.

COMMUNITY DIVERSITY SUMMARY
PATSY POND

Vascular Aquatic System — Panic grass bed
Tall, emergent stoloniferous grasses — Poaceae

PANICUM HEMITOMON
Panicum hemitomon

SOILS: A. Histosol; AA. Fibrist. B. Medifibrist, B. Sphagnofibrist; BB. Typic medifibrist, BB. Limnic sphagnofibrist. C. Euic, thermic typic medifibrist, C. Sandy, coprogenous, euic, thermic limnic sphagnofibrist; CC. Peat.
Topsoil: 0-3 m, black, peat, pH 5.5.
Subsoil: Sand.

HYDROLOGY: A. Emergent wetland; AA. Permanently flooded. B. Fresh; BB. Acid. C. Organic bottom; CC. Carbonaceous.

HYDROGRAPHY: A. Broad Creek and Sanders Creek which drain into Bogue Sound, Palustrine; AA. Natural impoundment ponds. B. Patsy Pond and associated ponds, Aqueous zones; BB. Zone. C. Smooth; CC. Open, variously exposed, nearly level slopes.

CANOPY: None present.
SUBCANOPY: None present.
SHRUBS: None present.

HERB LAYER DOMINANTS: Tall, emergent stoloniferous grasses.
HERB ANALYSIS: See Table 9.

ECOLOGICAL CHARACTERIZATION:

Vegetationally--Poaceous Vascular Aquatic System with tall, emergent stoloniferous grasses. Climatically--Warm, temperate mesothermal climate: Cool, moist yearly, moderately hot and moderately wet in the summer (July), moderately warm and moderately dry in the winter (January) and with a very long Frost Free season. Pedologically--Peat, euic, thermic typic medifibrist or sandy, coprogenous, euic, thermic limnic sphagnofibrist soil. Hydrologically--An emergent wetland with a bottom of carbonaceous organic material which is permanently flooded by fresh, acidic water. Hydrographically--A series of natural impoundment ponds of the palustrine system with open, variously exposed, nearly level slopes with a smooth surface and with a drainage system consisting of Broad Creek and Sanders Creek which flow into Bogue Sound. Temporally and spatially--Pioneer stage of a hydrohistosere in the Sea Island Section of the Atlantic Coastal Plain.

COMMUNITY DIVERSITY SUMMARY
PATSY POND

Vascular Aquatic System
Tall, emergent stoloniferous sedges OR
Tall, emergent rhizomatous sedges

Spikerush or beakrush bed
Cyperaceae/Nymphaeales

ELEOCHARIS EQUISETOIDES/NUPHAR LUTEUM
Eleocharis equisetoides/Nuphar luteum
OR
RHYNCHOSPORA INUNDATA/NUPHAR LUTEUM
Rhynchospora inundata/Nuphar luteum

SOILS: A. Histosol; AA. Saprist. B. Medisaprist; BB. Limnic medisaprist. C. Coprogenous, euic, thermic limnic medisaprist; CC. Muck.
Topsoil: Muck, pH 5.5.
Subsoil: Sand, pH undetermined.

HYDROLOGY: A. Emergent wetland; AA. Permanently flooded. B. Fresh; BB. Acid. C. Organic bottom; CC. Carbonaceous.

HYDROGRAPHY: A. Broad Creek and Sanders Creek which drain into Bogue Sound, Palustrine; AA. Natural impoundment ponds. B. Patsy Pond and associated ponds, Aqueous zones; BB. Zone. C. Smooth; CC. Open, variously exposed, nearly level slopes.

CANOPY: None present.
SUBCANOPY: None present.
SHRUBS: None present.

HERB LAYER DOMINANTS: Tall, emergent stoloniferous sedges or tall, emergent rhizomatous sedges.
HERB ANALYSIS: See Table 9.

ECOLOGICAL CHARACTERIZATION:

Vegetationally--Cyperaceous-Nymphaealean Vascular Aquatic System with tall, emergent stoloniferous sedges or tall, emergent rhizomatous sedges. Climatically--Warm, temperate mesothermal climate: Cool, moist yearly, moderately hot and moderately wet in the summer (July), moderately warm and moderately dry in the winter (January) and with a very long Frost Free season. Pedologically--Muck, coprogenous, euic, thermic limnic medisaprist soil. Hydrologically--An emergent wetland with a bottom of carbonaceous organic material which is permanently flooded by fresh, acidic water. Hydrographically--A series of natural impoundment ponds of the palustrine system with open, variously exposed, nearly level slopes with a smooth surface and with a drainage system consisting of Broad Creek and Sanders Creek which flow into Bogue Sound. Temporally and spatially--Pioneer stage of a hydrosere in the Sea Island Section of the Atlantic Coastal Plain.

COMMUNITY DIVERSITY SUMMARY
PATSY POND

Vascular Aquatic System

Free floating aquatics
Submergent rhizomatous aquatics OR
Rooted-floating leaf aquatics OR
Emergent rhizomatous aquatics OR
Rooted-floating leaf aquatics

Bladderwort mat OR Watermilfoil bed OR
Nymphoides bed OR Spatter-dock bed OR
Water-lily bed*

Scrophulariales
Haloragales
Gentianales
Nymphaeales
Nymphaeales

UTRICULARIA OLIVACEA / Utricularia olivacea OR MYRIOPHYLLUM LAXUM / Myriophyllum laxum OR NYMPHOIDES CORDATA / Nymphoides cordata OR

NUPHAR LUTEUM / Nuphar luteum OR NYMPHAEA ODORATA / Nymphaea odorata

SOILS: A. Histosol; AA. Saprist. B. Medisaprist; BB. Limnic medisaprist.
C. Coprogenous, euic, thermic limnic medisaprist; CC. Muck.
Topsoil: Not determined.
Subsoil: Not determined.

HYDROLOGY: A. Vascular aquatic, A. Floating-leaved aquatic, A. Emergent wetland;
AA. Permanently flooded. B. Fresh; BB. Acid. C. Organic bottom; CC. Carbonaceous.

HYDROGRAPHY: A. Broad Creek and Sanders Creek which drain into Bogue Sound, Palustrine;
AA. Natural impoundment ponds. B. Patsy Pond and associated ponds, Aqueous zones;
BB. Constant slope, BB. Pond zones of varying water depths and substrates.
C. Smooth; CC. Open, variously exposed, nearly level slopes.

CANOPY: None present.
SUBCANOPY: None present.
SHRUBS: None present.

HERB LAYER DOMINANTS: Free floating aquatics, submergent rhizomatous aquatics, rooted-floating leaf aquatics, or emergent rhizomatous aquatics.
HERB ANALYSIS: See Table 9.

ECOLOGICAL CHARACTERIZATION:

Vegetationally--Scrophularialean, Haloragalean, Gentianalean, or Nymphaealean Vascular Aquatic System with free floating aquatics, submergent rhizomatous aquatics, rooted-floating leaf aquatics, or emergent rhizomatous aquatics. Climatically--Warm, temperate mesothermal climate: Cool, moist yearly, moderately hot and moderately wet in the summer (July), moderately warm and moderately dry in the winter (January) and with a very long Frost Free season. Pedologically--Muck, coprogenous, euic, thermic limnic medisaprist soil. Hydrologically--An emergent wetland, vascular aquatic zone, or floating-leaved aquatic zone with a bottom of carbonaceous organic material which is permanently flooded by fresh, acidic water. Hydrographically--A series of natural impoundment ponds of the palustrine system with open, variously exposed, nearly level slopes and pond zones with a smooth surface and with a drainage system consisting of Broad Creek and Sanders Creek which flow into Bogue Sound. Temporally and spatially--Pioneer stage of a hydrosere in the Sea Island Section of the Atlantic Coastal Plain.

*Combinations of these also occur.

Table 9

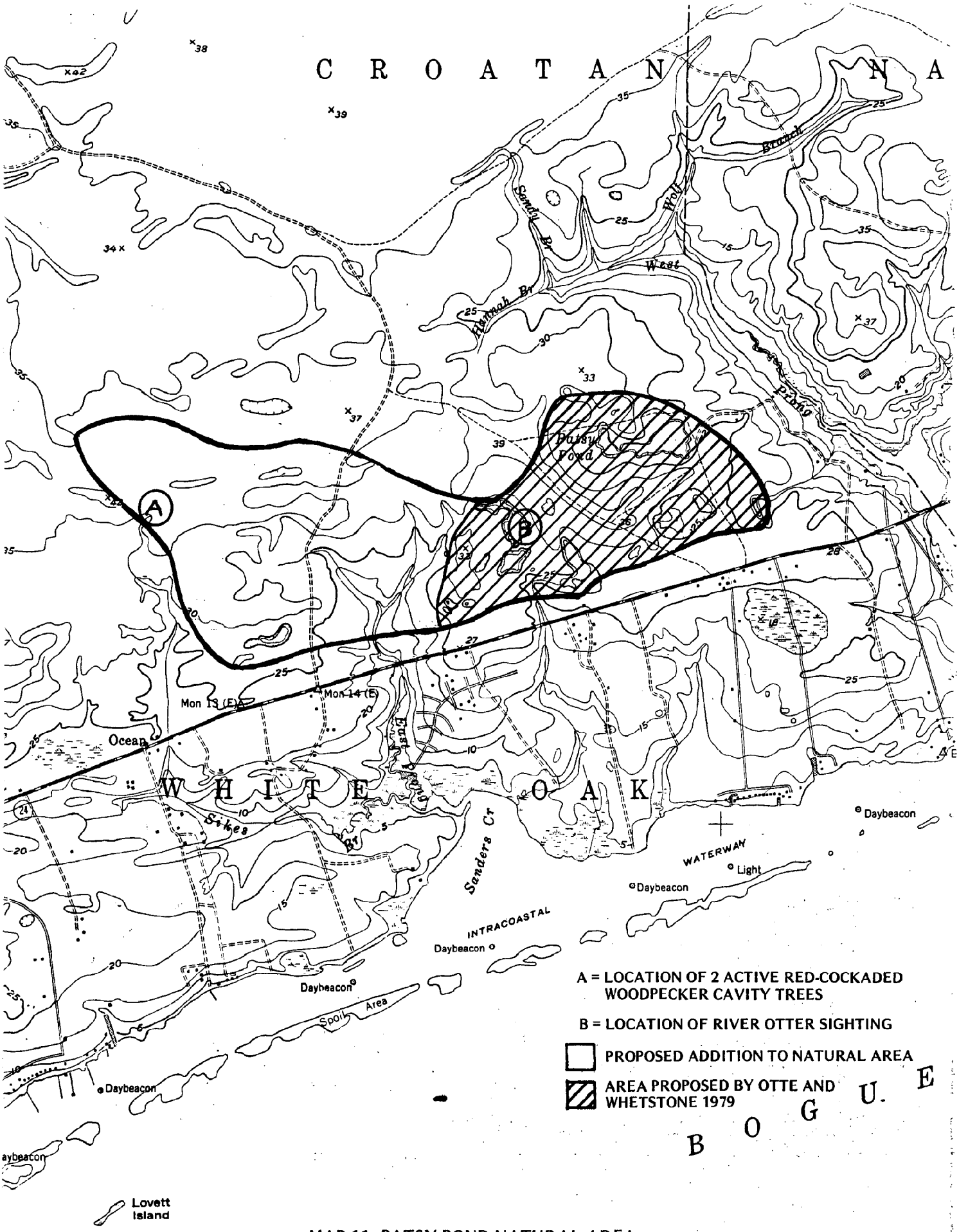
AQUATIC ANALYSIS:

Species	1 C.S	2 C.S	3 C.S	4 C.S	5 C.S	6 C.S	7 C.S	8 C.S	9 C.S	10 C.S	11 C.S	12 C.S	13 C.S	14 C.S	15 C.S	16 C.S	17 C.S
FREE-FLOATING AQUATIC																	
Utricularia olivacea	3.1	3.1	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
ROOTED-FLOATING LEAF AQUATIC																	
Nymphaea odorata	2.2	3.2	3.2	3.2	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Nymphoides cordata	5.2	+.2	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
SUBMERGED RHIZOMATOUS AQUATIC																	
Myriophyllum laxum	4.4	4.4	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
EMERGED RHIZOMATOUS AQUATIC																	
Nuphar luteum	-.-	-.-	-.-	-.-	-.-	2.2	-.-	1.2	2.2	-.-	-.-	4.2	1.2	+.2	+.2	+.2	2.2
EMERGED STOLONIFEROUS AQUATIC																	
Eleocharis equisetoides	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	+.5	-.-	4.5	5.5	4.5	4.5	4.5	4.5
Eleocharis sp. (W8754)*	+.2	+.2	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Panicum hemitomon	-.-	-.-	-.-	-.-	5.5	2.5	5.5	5.5	3.5	5.5	5.5	1.5	-.-	-.-	-.-	-.-	-.-

AQUATIC SPECIES PRESENT, BUT NOT IN ANALYSIS:
FREE-FLOATING LEAFY AQUATIC-Utricularia purpurea, EMERGED OR SUBMERGED CESPITOSE AQUATIC-Xyris caroliniana, EMERGED RHIZOMATOUS AQUATICS-Pontederia cordata, Rhynchospora inundata, EMERGED STOLONIFEROUS AQUATICS-Eleocharis robbinsii, Hydrocotyle sp., Proserpinaca pectinata, Sacciolepis striata, Sagittaria isoetiformis, Utricularia biflora, U. juncea.

# of Relevés 17

Relevé Size 1 m X 1 m



MAP 11: PATSY POND NATURAL AREA

Addendum to Natural Heritage Program Report on Patsy Pond Natural Area - by Otte and Whetstone 1979. by John Fussell and Jeannie Wilson 1 December 1980.

As part of our survey of natural areas of Carteret County during 1980 (contract work to Natural Heritage Program for the Office of Coastal Management), we surveyed the area of freshwater ponds and shallow marshes lying W and NW of the ponds studied previously by Otte and Whetstone. We wished to find out if these additional ponds were also of significant natural value and if the rarer species of plants found by Otte and Whetstone were also present in the more NW ponds.

We surveyed the area 11 and 14 October and beiefly on 13 November. We found none of the rarer plant species, but, in the case of the aquatics, this could have been due to the extremely dry summer and early fall. However, we were impressed with many features of these ponds and marshes. Some of these areas are obviously naturally impounded sections of former drainage systems; however, there are also depressions that exhibit "sinkhole" form. Some of these are less than 50' across with no water or wetland vegetation; larger ones have open water and/or marsh. Also this area has 2 or more marsh areas that are associated with Carolina bays. The ponds and marshes have a rather wide range of vegetation, which is generally different from the ponds to the SE. There are several zonation patterns associated with the ponds and marshes (many different from the ponds to the SE); one interesting situation was a dense band of Cassandra calyculata in one of the Carolina bay marshes. For these geological and botanical reasons, we recommend the addition of this area to the Patsy Pond Natural Area.

Also within this additional area, we found 2 active red-cockaded woodpecker cavity trees (See Map 11).

An addition to the rare fauna of the Patsy Pond Natural Area is the crawfish frog (Rana areolata) (species of special concern). Dr. Julian Harrison, College of Charleston, Charleston, S.C. collected this species in the 1950's (pers. com. to Fussell Sept. 1980). Collection was either at Patsy Pond or one of the immediately adjacent ponds. Also, we saw a river otter at site B (see Map 11) 13 November.

The Patsy Pond Natural Area is much in need of more frequent fire management. Especially needed is the determination of the effects of fire on the shrub vegetation on the slopes of the ponds and marshes in a natural situation; currently these areas are protected from fire by the presence of fire lines between them and the more flammable Pinus palustris/Quercus laevis/Aristida stricta community.

Unfortunately, human abuse of the natural area continues.

Shackleford Bank

Name of Area: Shackleford Bank[1]

Location: Carteret County, North Carolina; Beaufort and Harker's Island 7.5 min. USGS topographic quad map; separated from Cape Lookout at the eastern end of the island by Barden Inlet and from Bogue Banks at the western end by Beaufort Inlet and is bounded by Back Sound and the Atlantic Ocean (see map 12).

Ownership and Administration: Presently Shackleford Bank is in divided private ownership. The entire island is to be acquired by the National Park Service (NPS) as part of the Cape Lookout National Seashore.

Size: 2280 acres (923 ha).

Land Use: Shackleford Bank has retained a degree of remoteness and wildness since public transportation to the island has been lacking and private boats provide the only means of access. The proposed management plan by the NPS provides ferry service to Shackleford for a limited number of visitors in addition to the existing private boat access. Presently, a few private vehicles such as cars, dune buggies and motorcycles exist on the Bank, but Park plans prohibit vehicular use and provide no on-island transportation once land acquisition is completed.

The island is virtually free of development except for private "fish camps" which dot the sound-side landscape. Pending the time when leases and life estates terminate, these cottages will be removed, and this land, like the undeveloped portion, will be classified as wilderness. The primary land use is beach recreation on both the ocean and sound sides, fishing, camping, hiking and nature study. Authorizing legislation for the Park also permits hunting and shell-fishing in designated areas. Furthermore, the island is used extensively as an outdoor laboratory and education grounds by many universities and research facilities throughout the East for the study of barrier island ecology.

Dangers to Integrity: Under the classification of natural (wilderness) zone, Shackleford will be relieved in part from some of the presently existing pressures of uncontrollerd land use such as off-road vehicles. Nevertheless, other threats to the natural integrity have been cited: The Army Corps of Engineers have proposed dredge spoil sites on Shackleford from their activities in Beaufort Inlet. Feral animals (cows, sheep, goats and horses)

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[1]Compiled from information in the N.C. Natural Heritage Program files. Additional information is available from the Heritage Program, DNRCD, Division of Parks and Recreation, Raleigh, N.C. (1980).

roam the island and are considered to impart destructive impacts to dune and maritime forest vegetation thereby accelerating the encroachment of sand upon the forest. Further studies are planned before final decisions to remove the livestock are announced. Solid wastes litter the island and in some cases are hazardous to visitors.

Protection Status: Under NPS administration, all of Shackleford is proposed as a "natural zone" and will be recommended and protected as a wilderness with minimal visitor facilities.

Reasons for Significance: Shackleford Bank is a remote island in the Outer Banks chain which, unlike other barrier islands, has been relatively undisturbed by people during the last 7 years. The Bank is approximately 9 miles long varying in width up to one half mile. Its east-west orientation situates it perpendicular to the prevailing winds thereby resulting in unique physiographic characteristics which provide an interesting contrast to the other barrier islands of the Outer Banks.

The eastern two thirds of the island resembles the barrier islands to the north: low dunes near the ocean, grasslands, low shrub trees and an extensive salt marsh. Scattered throughout this portion of the Bank, occasional "ghost trees" and stumps mark the former existence of a once extensive maritime forest. The area is now an over-wash formed during severe storms and now claimed by sea oats and other salt tolerant dune grasses. In contrast, the western end of Shackleford features dunes 30-40 feet high formed by prevailing on-shore winds. The high dunes provide an effective barrier from wind and salt spray for the sound side vegetation. As a result, an extensive and well developed maritime forest still remains. This beautifully formed, remnant forest is one of the last undisturbed examples of this type of ecosystem. It is composed primarily of Eastern red cedar, live oak, American holly, and Loblolly pine. Another notable feature is the presence of permanent, fresh water ponds such as Mullet Pond which supports the unique Marsh killifish (Fundulus confluentus). "Marshes are distributed between thickets or on the sound side of the forest. Also, wherever the ground surface approaches the water table inside the forest, wet thickets or or fresh marsh is formed. As a result, maritime forest, thickets and marshes compose an intricate vegetation pattern," (Au, 1974). Associated with the marshes are vast, lush grasslands which extend into the sound in some places. Here ungulates, mostly feral horses, can be seen grazing; the Shackleford horses compose one of the last free ranging herd of any consequent size in the East. Furthermore, Shackleford serves as a nesting ground for the Atlantic Loggerhead Sea Turtle, an endangered species. It also supports many plants of special status such as Drummond's Prickly Peat (see Table 10), which can be found between the dunes. In short, Shackleford exhibits a much greater plant and animal diversity than any other of the Cape Lookout National Seashore islands due to the physiographic features of land-wind orientation and the presence of the 85 maritime forest.

Moreover, it contains more rare and endangered plants and animals than the other islands of the Outer Banks without a complete overlap in species composition. Shackleford Bank warrants recognition as a natural area for its wilderness, biotic diversity and unique ecosystems and its significance for the scientific study of barrier islands.

Preserve Recommendation: Because of the geological, biological and physiographical diversity, Shackleford should remain and be protected as a natural area with efforts to promote it as a recognized wilderness. It is recommended that the island serve as an ideal study ground for barrier island ecology and that such studies be encouraged in order to accrue further knowledge for the management of such systems.

Data Sources:

Preston D. Riddle, Supervisor and staff, Cape Lookout National Seashore, Beaufort, N. C.
Paul J. Godfrey, National Park Service Cooperative Research Unit, University of Massachusetts, Amherst, Mass.
John O. Fussell, Morehead City, N. C.
Jeannie Wilson, Hampton Mariners Museum, Beaufort, N. C.
National Park Service, General Management Plan and Environmental Impact Statement.

Scientific References:

Au, S. (1974) Vegetation and ecological processes on Shackleford Banks, North Carolina. National Park Service Scientific Monograph Series No. 6. 86 p.
Engles, W. L. (1952) Vertebrate fauna of North Carolina coastal islands. II. Shackleford Banks, Am. Midlt. Nat. 47: 702-742.
Godfrey, P. J. and Godfrey, M. M. (1976) Barrier island ecology of the Cape Lookout National Seashore and vicinity, North Carolina. National Park Service Scientific Monograph Series. No. 9 160 p.
Lewis, I. F. (1917) The vegetation of Shackleford Bank. N. C. Geol. Econ. Surv. Eco. Pap. 46. 32 p.

Documentation and Authentication: Voucher specimens and documentations are all on file at the Cape Lookout National Seashore headquarters in Beaufort, North Carolina. See Management Report: Preliminary Resource Inventory of the Vertebrates and Vascular Plants of the Cape Lookout National Seashore, North Carolina, Management Report No. 22. Herbaria, etc. for voucher specimens are listed for described species.

Table 1a. Special Animals on Shakleford Banks

Special Name	Common Name	Status[2]	No. NC Sites[3]	Habitat
Caretta caretta caretta	Atlantic Loggerhead Sea Turtle	E	20	Open seas, warm waters, nests on beaches
Natrix sipedon williamengelsi	Caroline Salt Marsh Snake	SC	4	Seaside and estuarine conditions on Outer Banks
Fundulus confluentus	Marsh killifish	SC	1	Coastal freshwater marsh ponds

[2]Taken from Cooper, J. E., S. S. Robinson, and J. B. Funderberg (Eds.). 1977. Endangered and Threatened Plants and Animals of North Carolina. N. C. Museum of Natural History, Raleigh, N. C. 444 pages + i-xvi.

[3]Number of recorded occurrences of species in state known by the Natural Heritage Program as of July 1979.

Explanation of Status Categories

Animals

E - Endangered
T - Threatened
SC - Special Concern
UD - Undetermined

Table 10. Special Plants on Shakleford Banks

Scientific Name	Common Name	Status[2] *	Habitat
Agalinis maritime	Saltmarsh gerardia Seaside foxglove	EP	Salt marshes
Corallorhiza wisteriana	Spring coral root	TP	Swamp forests, rich ravines
Opuntia drummondii	Drummond's prickly pear	TP	Sand dunes and sandy pine woods
Parietaria floridana	Florida pellitory	EP	Maritime forests
Ludwigia repens	Creeping marsh-purslane	EP	Ditches, ephemeral pools
Rhynchospora odorata	Fragrant beakrush	TP	Swamp forests and low disturbed areas
Ludwigia microcarpa	Tiny fruited seedbox	EP	Ditches and marshes
Ludwigia alata	Winged seedbox	EP	Marshes

* These plants are no longer listed as endangered or threatened by the N.C. Department of Agriculture's Plant Protection Program.

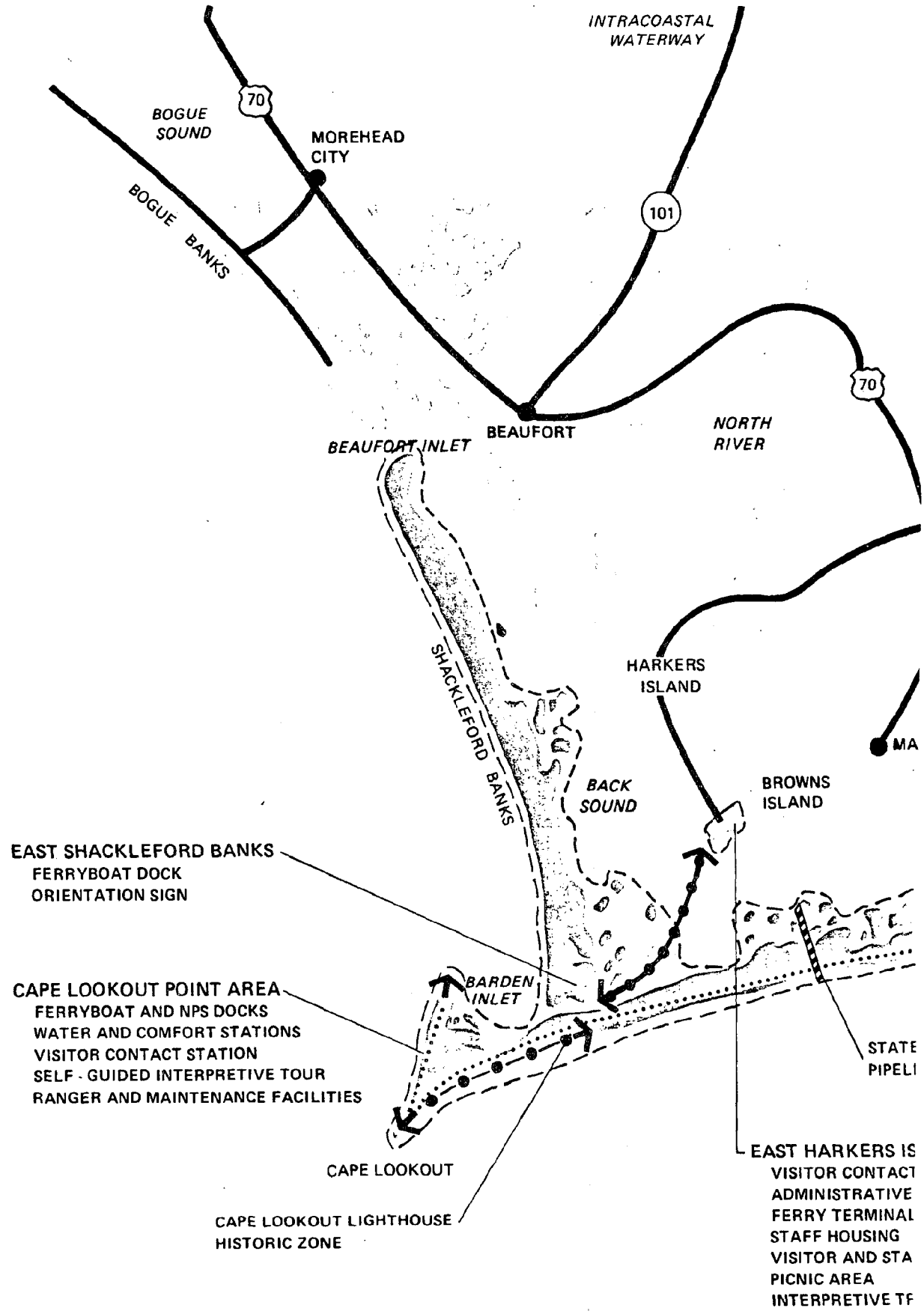
[2]Taken from Cooper, J. E., S. S. Robinson, and J. B. Funderberg (Eds.). 1977. Endangered and Threatened Plants and Animals of North Carolina. N. C. Museum of Natural History, Raleigh, N. C. 444 pages + i-xvi.

Explanation of Status Categories

Plants

EE - Endangered Endemic
ED - Endangered Disjunct
EP - Endangered Peripheral
ET - Endangered Throughout

TE - Threatened Endemic
TD - Threatened Disjunct
TP - Threatened Peripheral
TT - Threatened Throughout



MAP 12: SHACKLEFORD BANKS

Theodore Roosevelt Natural Area

Name of Area: Theodore Roosevelt Natural Area and adjacent undisturbed areas.

County: Carteret

Location Description: This area consists of the largely undeveloped tract of approximately 450 acres that is bounded by Bogue Sound to the north, Pine Knoll Boulevard in Pine Knoll Shores to the northeast, Iron Steamer Pier to the southeast, the Atlantic Ocean to the south, and Ramada Inn property to the west. The "nucleus" of this tract is the Theodore Roosevelt Natural Area (265 acres), which is administered by the Division of State Parks & Recreation, Department of Natural Resources and Community Development. See Map 13.

Topographic Quadrangle Map: Mansfield

Ownership: See Map 14.

Report Prepared by: John O. Fussell, III
1412 Shepard Street
Morehead City, N. C. 28557

Jeannie Wilson
Hampton Mariners Museum
Beaufort, N. C. 28516

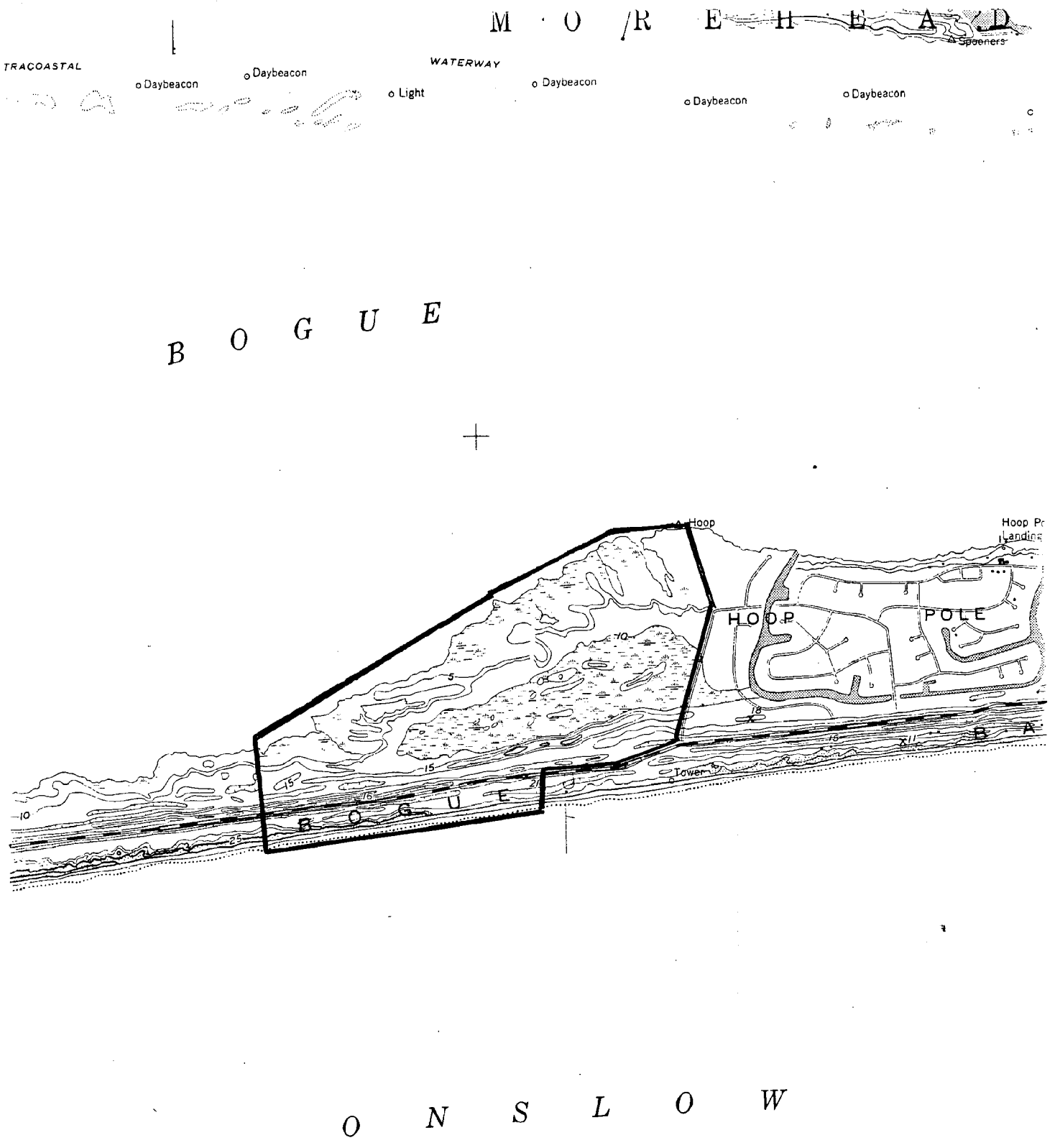
Date: 1979

Other Persons Knowledgeable about Site:

Dr. Vincent Bellis
Department of Biology
East Carolina University
Greenville, N. C. 27834

Mr. David M. DuMond
Biology Department
University of North Caroina at Wilmington
Wilmington, N. C. 28401

Mr. Mark Joyner
North Carolina Marine Resources Center
Route 1
Morehead City, N. C. 28557



MAP 13: ROOSEVELT NATURAL AREA

Current Use and Protection Status:

The area covered by this report consists primarily of four tracts:

1) the Theodore Roosevelt Natural Area which consists of 265 acres. This area was set aside to remain in its natural state; it is administered by the Division of State Parks.

2) the North Carolina Marine Resources Center tract which lies within the Theodore Roosevelt Natural Area. This tract, which is administered by the Department of Administration, consists of approximately 25 acres. Approximately five acres have been developed for the Resources Center building, parking lots, etc. At this time, there are no plans to develop or alter the other 20 acres.

3) approximately 114 acres between the Theodore Roosevelt Natural Area and Pine Knoll Boulevard in Pine Knoll Shores. Most of this area is still undeveloped and in its natural state. The Pine Knoll Shores town hall is at the edge of this tract, and there is an electric substation, a water tower, and a power line right-of-way within it. All this tract is zoned for commercial development. As much of the tract is swamp forest, its use as a commercial area would of course require the destruction of the tract as a natural area. Some of this tract that is adjacent to Bogue Sound is marshland and is thus designated as an area of environmental concern.

4) approximately 47 acres between the Salter Path Road and the ocean. This tract is largely in its natural state; there are a few footpaths through it and several surveyors' transects. It is zoned commercial/residential, i.e. motels, condominiums, etc. The seaward strip that is within 75 feet of the mean high water mark is designated as an area of environmental concern.

Vegetation and Plant Communities:

The presence of a relict beach ridge system with its alternating dune ridges and swales (troughs) is an important determinant of the vegetation of the area. This topography has resulted in many levels of moisture and salinity within the area, which has contributed to several habitats and a large number of plant species. Within the area, plant composition is also related to distance from the ocean, i.e. to salt spray intensity.

The appendixed Natural Areas of (Theodore) Roosevelt Natural Area (prepared in 1974 for the Division of State Parks) discusses the natural communities of the Theodore Roosevelt Natural Area, which is largely representative of the total area covered by this report. However, the area south of the Salter Path Road (and not within the Theodore Roosevelt Natural Area) borders the ocean and includes beach and a narrow dune zone. Also, the forest south of the highway is "more maritime" than the forest north of the highway- - - i.e. it is more sheared by salt spray and more strongly dominated by live oak (Quercus virginiana), red cedar (Juniperus virginiana), wild olive (Osmanthus americana), red bay (Persea borbonia), Carolina cherrylaurel (Prunus caroliniana), etc

Physical Features:

This area's physiognamy is determined largely by the presence of a prominent relict beach ridge system. The ridges range from approximately two to 20 feet above sea level. Elevations of the interlying swales range from sea level to two feet. Seaward, the dune ridges essentially parallel the present shoreline. Soundward, many curve toward the northwest. This curvature is of geological interest. Fisher (1967) thought that his curvature was not due to a migrating inlet. The ridge system has been largely stable for a very long period. Fisher (1967) suggested that the sound-side ridges are at least approximately 1200 years old. This stability, as compared to the relative instability of most sections of North Carolina's barrier islands is also of geological interest.

Rare Plants and Animals:

Plants-

Species	Status in North Carolina	Comments
Halodule beaudettei	Threatened	Occurs in adjacent sound
Parietaria floridana	Endangered peripheral	
Opuntia drummondii	Threatened peripheral	
Agalinis maritima	Endangered peripheral	

Animals-

American alligator (Alligator mississippiensis)	Endangered	Resident- sometimes nests in area
Atlantic loggerhead (Caretta caretta caretta)	Endangered	May rarely nest, or attempt to, on ocean beach
Brown pelican	Endangered	Adjacent ocean and sound
Great blue heron	Special concern	
Great egret	Special concern	
Snowy egret	Special concern	
Little blue heron	Special concern	
Louisiana heron	Special concern	
Yellow-crowned night heron	Special concern	
Black-crowned night heron	Special concern	
White ibis	Special concern	
Black duck	Special concern	
Red-shouldered hawk	Threatened	Nests in area
Osprey	Special concern	Nests in area

Merlin	Threatened	Migrant in area
Peregrine falcon	Endangered	Migrant in area
King rail	Special concern	
Gull-billed tern	Special concern	
Laughing gull	Special concern	Adjacent ocean and sound
Least tern	Special concern	Adjacent ocean and sound
Common tern	Special concern	Adjacent ocean and sound
Royal tern	Special concern	Adjacent ocean and sound
Sandwich tern	Special concern	Adjacent ocean and sound
Black skimmer	Special concern	
Purple martin	Special concern	
(Wayne's)Black-throated green warbler	Special concern	Nests in area
Swainson's warbler	Special concern	Nests in area some years
Prothonotary warbler	Special concern	Nests in area

Publications and Scientific References:

Fisher, J.J. 1967. Development pattern of relict beach ridges, Outer Banks barrier chain, North Carolina. Doctoral dissertation. University of North Carolina at Chapel Hill. Chapel Hill, N.C.

Flora Species List:

See appendixed Vascular Plants of (Theodore) Roosevlet Natural Area (prepared in 1974 for the Division of State Parks). This includes almost all plant species that occur in the area covered by this report.

Fauna Species List:

See appendixed Fish, Amphibians, Reptiles and Mammals of (Theodore) Roosevelt Natural Area and Summer Birds of (Theodore)Roosevelt Natural Area (both prepared in 1974 for the North Carolina Division of State Parks).

To the bird list, the following species should be added:

White Ibis- visitant all year
Black Duck- winter visitant
Merlin- uncommon fall transient
Peregrine Falcon- rare fall transient
Sandwich Tern- transient

Evaluation of the Site's Ecological Significance:

1) This area is geologically significant because the well-defined system of ancient relict beach ridges is virtually undisturbed. The fact that the ridges have been stable for so long is of interest, as is the fact that those next to Bogue Sound curve northwestward. It is also interesting that several large shoals in adjacent Bogue Sound have the same northwest-southeast alignment as the northward ends of the relict beach ridges on the island.

2) The stabilized relict beach ridge system has contributed to a large number of habitats in a relatively small area. Wetland habitats are salt marsh, brackish marsh, fresh marsh, temporary ponds (both fresh and saline), shrub swamp, swamp forest, and pond holes. Plant communities of the ridges are maritime forest and maritime shrub thicket.

The most significant of the above are the maritime forest and swamp forest. In North Carolina, maritime forests are rapidly being destroyed by man. This area is now the least humanly disturbed example of the type of maritime forests in the state south of Cape Hatteras, those that are dominated by red cedar and broadleaf evergreen species such as live oak, laurel oak (Quercus laurifolia), red bay, wild olive, and Carolina cherrylaurel. This is also the only area in the state where there still remains a complete cross-section-- ocean to sound-- of maritime forest. The tract of forest south of the Salter Path Road is especially unique. No where else in North Carolina does forest occur so close to the ocean-- as close as 200 feet to mean high water. (Adjacent similar areas have been or are now being altered by human development.) It should be noted that this is the "natural" situation here-- old charts show the same forest to ocean proximity in the mid to late 1800's. This seaside tract of forest is dominated by live oak. It is probably the only tract of live oak-dominated forest in the state that is on a site that has apparently been stable for several hundred years.

The swamp forest of the area is also unique. This is the only tract of swamp forest on the barrier islands of North Carolina. It is interesting that bald cypress (Taxodium distichum) is absent here. Also interesting is the relative abundance of ash (Fraxinus tomentosa).

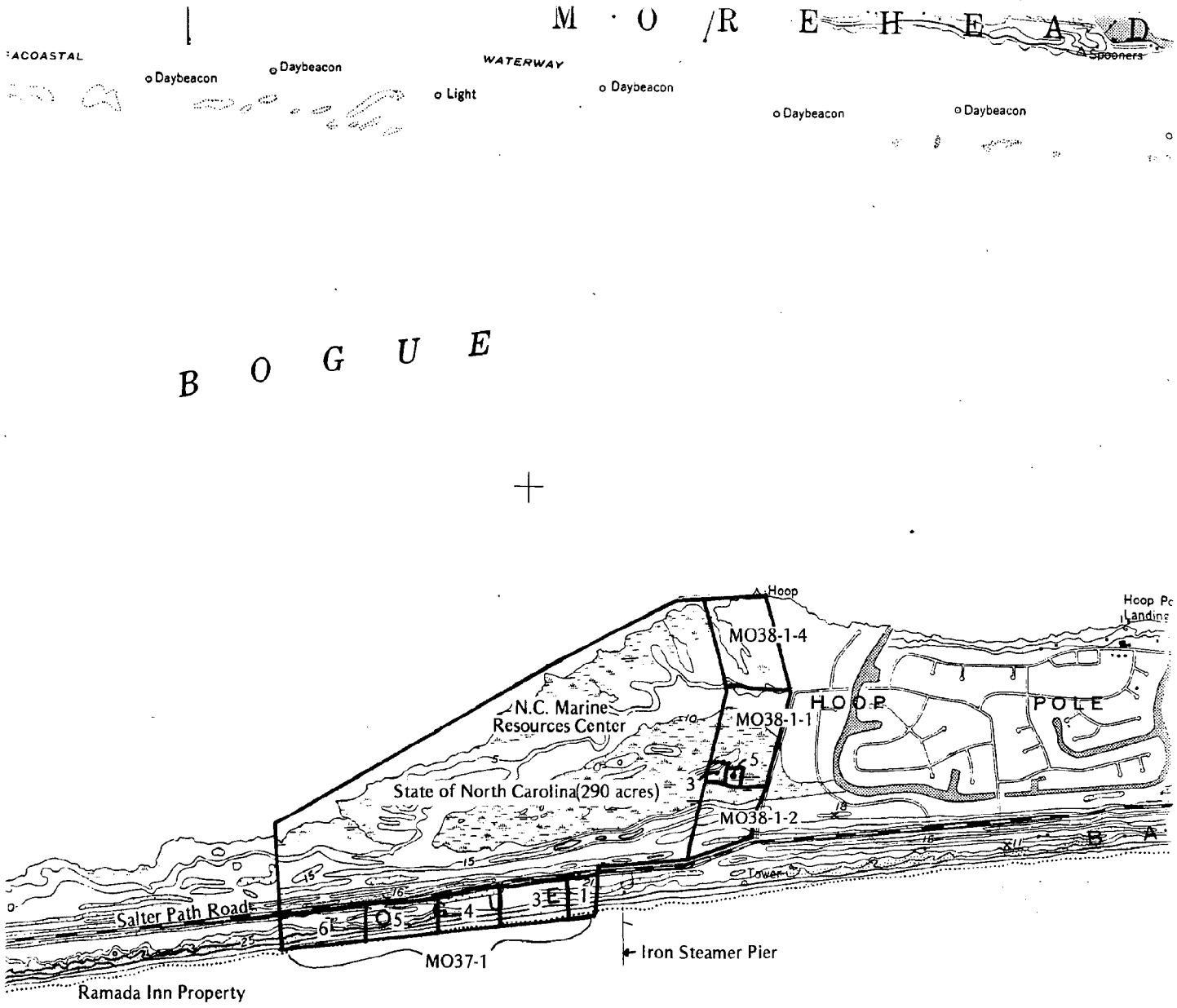
3) This area is important to a large number of rare species:

a) There are two endangered plant species and two threatened plant species in the area.

b) The endangered American alligator is resident and, at least occasionally, nests within the area; the loggerhead turtle may occasionally nest on the ocean beach; the endangered brown pelican feeds in the adjacent ocean and sound; the endangered peregrine falcon sometimes uses the area during the fall migration.

c) The threatened red-shouldered hawk nests in the area every year, and the threatened merlin uses the area during the fall migration.

d) Also, 22 bird species of special concern occur in the area; at least four of these nest within the area.



MO37-1-1	3.77 acres	First Citizen's Bank and Trust Co.
MO37-1-3	11 acres	Frances Webb Roosevelt, Box 736, Pine Knoll Shores, Morehead City, NC 28557
MO37-1-4	12 acres	Theodore Roosevelt III (address as above)
MO37-1-5	10 acres	Grace Roosevelt McMillan (address as above)
MO37-1-6	10 acres	Cornelius van Schaak Roosevelt (address as above)
MO38-1-1	60 acres (approx.)	T.R. Roosevelt III, et al, Box 736, Pine Knoll Shores Morehead City, NC 28557
MO38-1-2	24.2 acres	T.R. Roosevelt III, et al, (address as above)
MO38-1-3	2 acres	Carteret-Craven Electric Membership Corporation Morehead City, NC 28557
MO38-1-4	27 acres	Town of Pine Knoll Shores
MO38-1-5	1 acre	Carolina Water Corporation, Pine Knoll Shores

MAP 14: OWNERSHIP OF THEODORE ROOSEVELT TRACT

e) Two species, although not listed as rare, are still of special interest. An orchid (Triphora trianthophora) is primarily a mountain species-- its relative abundance in the maritime forest of this area is very interesting. A fresh-water clam (Sphaerium sp.) occurs in the swamp forest. There is some possibility that this could be an endemic race or species.

f) The area also has a large number of species that, although not rare, are of interest because they are near their northern limit. It also harbors several species that are generally rare or absent elsewhere on North Carolina's barrier islands.

4) This area is used regularly for scientific research. Geological, botanical, and zoological research have been done here. At least two theses are based partly on research done in this area.

5) This are has educational value. Educational groups-- especially school groups-- use the area, including both beach and forest areas, for field trips and field projects.

6) There is at least one historically notable point about the area. Toward the west end of the tract, there is an old sound to ocean path that dates back to the 1800's. This was one of many saml1 footpaths that once crossed the island. The community of Salter Path was named for such a path.

Management Recommendations:

(Note: this area is listed in the Register of National Natural Landmarks and State Registry of Natural Heritage Areas)

Clearly, this area, with its prominent relict beach ridge system, many different plant communities, excellent examples of maritime forest (especially the area where forest occurs so close to the ocean), the unique presence of swamp forest, the large number of rare and endangered and other notable species, and scientific and educational value, is deserving of area of environmental concern status.

Furthermore, we can envision no development in the area that would be consistent with the continuation of the values of this natural area. Between Theodore Roosevelt Natural Area and Pine Knoll Boulevard, any development would require the filling in of the swamp forest and thus the destruction of the area as a natural area. Development south of the Salter Path Road might be done tastefully, but the most tasteful development in adjacent maritime forest areas still effectively destroyed the forest, since virtually all the canopy is removed.

If, of the total land included in this report, only the Theodore Roosevelt Natural Area remains in its natural state, then it is very likely that at least two or three of the rare and endangered species now in the area will be exterminated from it.

Atlantic Natural Area

Natural Area Name: Atlantic Natural Area

County: Carteret

Location: This tract of land lies northwest of the community of Atlantic. Specifically, it lies along both sides of the section of N.C. 12 between U.S. 70 and Co. Rd. 1387. It includes the tract extending about 1.75 miles nw. of N.C. 12 and 1.25 miles to the southeast of N.C. 12. The center lies 34°54' N., 76°23'30" W. See Maps 1 and 15.

Topographic Quadrangle: Atlantic and Long Bay, N.C.

Size: ca. 3000 acres

Elevation: 3 to 16' above sea level

Access: Easily accessible from N.C. 12 with many sand roads going into the area along the sand ridges

Names of investigators: John O. Fussell, III and Jeannie Wilson

Date(s) of investigation: Study from November 1979 through May 1980

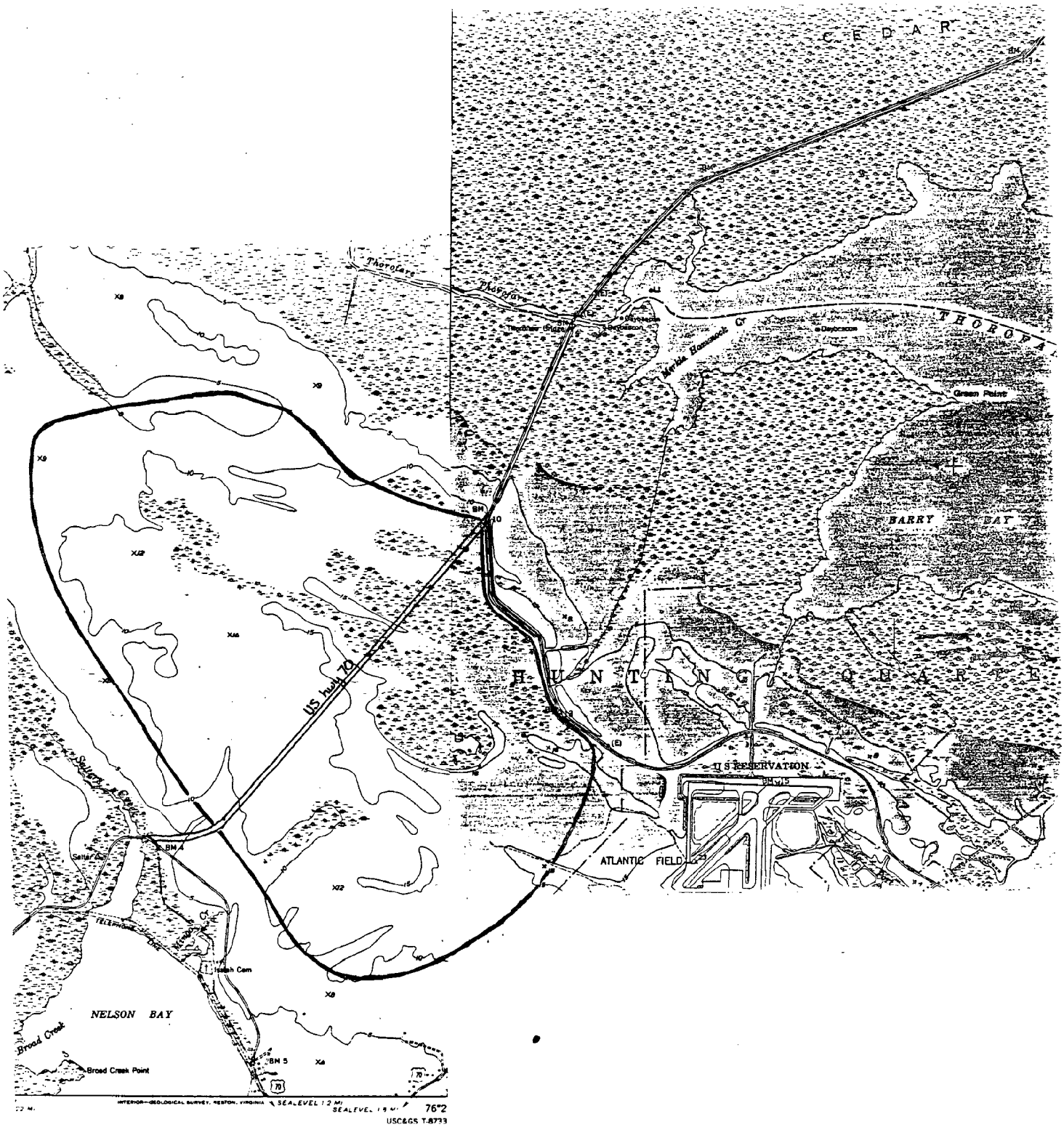
Individual dates of visits: November 23, 1979
February 24, 1980
March 31, 1980
April 13, 1980
May 24, 1980

Also, Fussell made many brief visits looking for birds and listening for frogs from 1970 to the present.

Legal status and use: Ownership type by percent area -- Private 100%

Number of owners: two

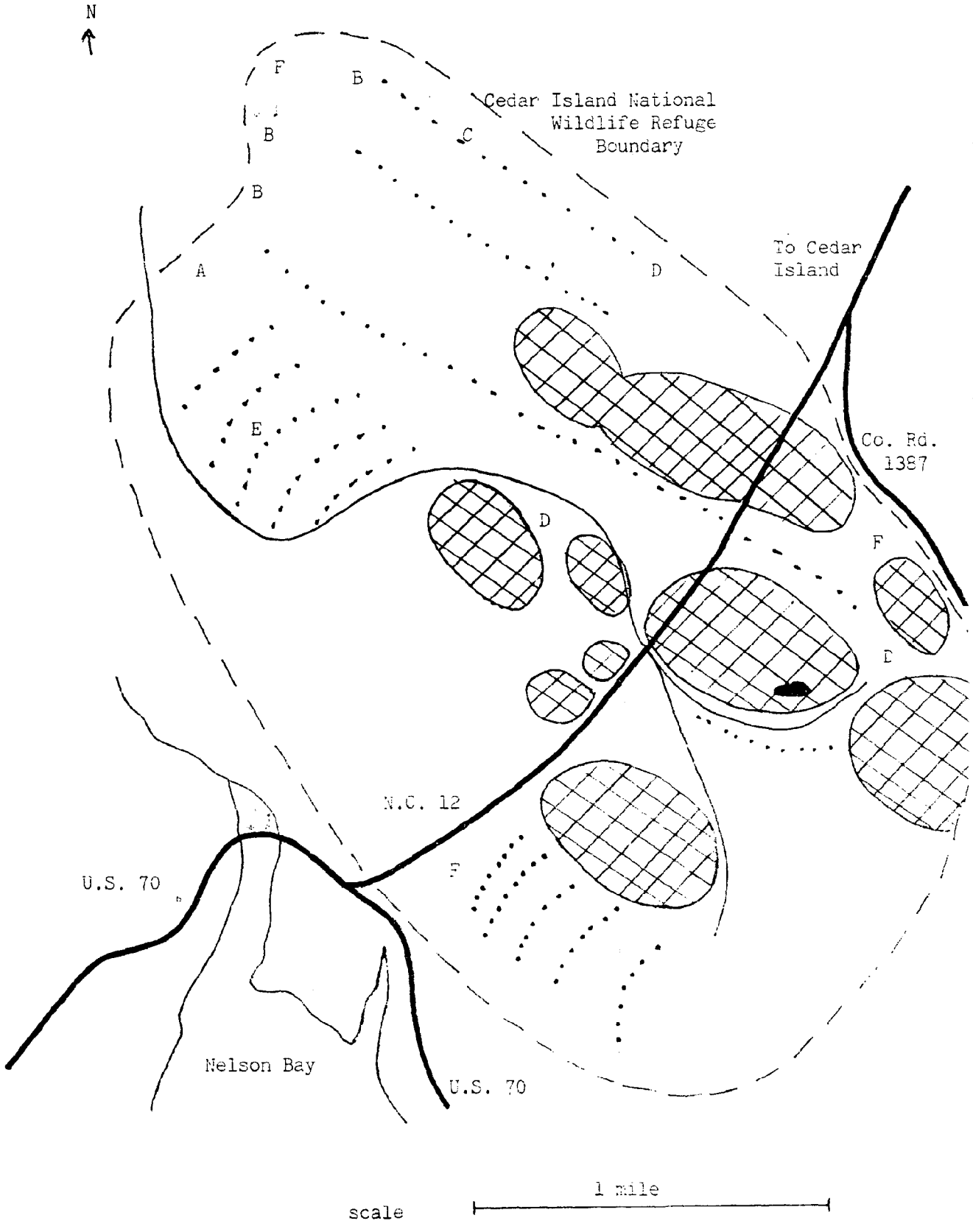
Names of owners or custodians: Duke University, Durham, N.C.
Sailors Snug Harbor, Atlantic, N.C. 28557



MAP 15: ATLANTIC NATURAL AREA

Significance Summary (See Map 16)

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
Endangered species	d.	Red-cockaded woodpecker: occurs in longleaf pine ridge, pocosin and Carolina bay habitats.	This species is virtually extirpated from eastern Carteret County.
Endangered species	no specific site	Bald eagle	Adjacent area to the northwest is a potential breeding area. The species is not now known to breed in N.C.
Endangered species	no specific site	There has been a local report of a mountain lion in the area, but it has not been documented.	There have been no documented reports recently in the county.
Habitat with relict species	see map	Leiophyllum buxifolium: Occurs on longleaf pine ridges southeast of N.C. 12	To the best of our knowledge, the nearest population of this species is Brunswick, Bladen & Robeson Cos.
Outstanding geologic feature	see map	Prominent relict beach ridge system.	Most relict beach ridges in N.C. represent former ocean shorelines. Mixon & Pilkey (1976) suggest this system was formed along an estuarine shoreline.
Outstanding geologic feature	see map	Prominent Carolina Bays	In the northeastern half of Carteret County, Carolina Bays occur mostly within this area.



MAP 16: ATLANTIC NATURAL AREA, SIGNIFICANT SUMMARY

Use of Natural Area: The primary low intensity use of this area is hunting. Although the area has not been systematically logged recently, the cumulative effect of many private individuals cutting longleaf pines on the ridges is noticeable. The main intrusion of the area is its use of a dumping area, but dump sites are mainly restricted to one sand road.

Use of surrounding land: a. Wildland 95% b. Agricultural land 5%

Management Problem Description	Impact	Effort
Control of human overuse and abuse-control of dumping	affects natural land	2, possibly 1 if closing roads to dumping is done effectively
Vegetation and animal management. Area would benefit from a fire management program.	significant features	2
Presence of jeep trails	natural land	2, pissibly 1 if roads can be cloaed to vehicles.

Preservation status: Private land, not protected by owner.

Regulatory protections in force: There are no regulatory protections that we know of. None of the land is an AEC, which includes intertidal areas. The land to the north of the study area is part of the Cedar Island National Wildlife Refuge. The same kinds of habitats exist within part of the refuge (longleaf pine ridges, pocosins, and Carolina Bays), but the total area of these habitats is small.

Attitude of owner or custodian toward preservation: unknown

Threats:

Threat	Category	*SF
logging pines	2- threat of destruction known, but not immediate	*
dumping	2	
jeep trails	2	
development (probably confined to dry areas)	3 or 4- no known threat & a possibility that a threat will develop within 5 years	*
peat mining	4- no known threat & no likelihood that a threat will develop within 5 years	*

Management and Preservation Recommendation: Considering the sorts of natural values of this tract, it is difficult to delimit features that are more worthy of preservation than other features. One value of the tract is its size, and any diminishment in size increases the liklihood of species within being extirpated. This is true of species such as the Red-cockaded Woodpecker that are restricted to an already small "island" of suitable habitat and species that require large "wilderness" tracts, such as Bald Eagle and Black Bear.

There is a possibility that Duke University may sell the tract northwest of N.C. 12. Since the land has virtually no commercial value, it is probably not threatened by any sudden extreme alteration. If it were sold, the most likely future alteration might be the building of homes along the highway. This would have little immediate direct impact on the rest of the area, but would detract from the near-wilderness character and could also lead to a decrease in the incidence of wildfires that are important in maintaining certain plant communities.

Considering the fact that the Cedar Island National Wildlife Refuge abuts the northwest portion of this tract and that particular portion includes all the endangered and threatened species we found, it might be appropriate for the U.S. Fish and Wildlife Service to acquire most or all of that area. The Fish and Wildlife Service is certainly an appropriate agency to administer a fire management program which the area badly needs.

If the Fish and Wildlife Service were to acquire the land northwest of N.C. 12, and if Sailors Snug Harbor, which probably is not considering selling the land, could be made to realize the natural significance of their land through the Natural Heritage Program, then the entire study area would be reasonably well preserved. However, a fire management program for the area southeast of N.C. 12 would still be lacking.

24. Natural Characteristics Summary

a. Vegetation-Biotic Community Summary

Community Type: 1. Pinus palustris/Myrica cerifera/Gaylussacia frondosa/Aristida stricta (west of N.C. 12)
or 1. Pinus palustris/Myrica cerifera/Leiophyllum buxifolium/Aristida stricta (east of N.C. 12)
2. Pinus serotina/mixed heaths/Sphagnum spp./ Smilax laurifolia.

Community Cover Type: 1. Pinus palustris
2. Pinus serotina

General Habitat Feature: 1. Relict interior dune, savannah
2. Carolina Bay, Pocosin in dune swales.

Average tree height: 1. 30' 2. 25'

Estimated Age of canopy trees: 20 to 30 years old judging by size
Trees were not cored.

Estimated size of association: 1. 1200 acres 2. 1800 acres (approx.

Successional Stage: Transient and climax present. It varies throughout because of regular fires.

Sere type: 1. Psammosere 2. Hydrosere or psammosere

Common canopy species in community cover type or community type (but not dominant): 1. Quercus laevis, Q. virginiana, Pinus taeda, Persea borbonia
2. Persea borbonia, Acer rubrum, Nyssa sylvatica

Common subcanopy-shrub stratum species in community cover type or community type (but not dominant):
1. Ilex glabra, I. vomitoria, Lyonia mariana
2. Ilex glabra, Cyrilla racemiflora, Myrica heterophylla.

Common herb stratum species in community type (not dominant)
1. Aster linariifolius, Heterotheca nervosa, Solidago fistulosa, Rhexia lutea, Andropogon scoparius, Panicum portoricense, Pteridium aquilinum.
2. Sarracenia flava, Agalinis obtusifolia, Xyris caroliniana, Rhynchospora spp., Woodwardia virginica.

b. Soil Summary

Source of information:
Soil Conservation Service, USDA. 1979. Soil Survey of Carteret County, N.C. (interim report).
Gina Boccetti , Soil Conservation Service, Beaufort, N.C.

1. Series: Leon Sand
Order: Aeric Haplaquod, fine loamy, silicious, thermic (Spodosol)
pH Class: extremely acid to strongly acid (3.6-5.5)
Moisture class: wet to droughty, cemented pan.
Community: Pinus palustris, ridges.

2. Series: Mandarin Sand
Order: Typic Haplohumod, sandy silicious, thermic (Spodosol)
pH Class: Extremely acid to medium acid (3.6-6.0)
Moisture Class: wet to droughty.
Community: Pinus palustris, rims of Carolina bays.

3. Series: Murville Sand
Order:Typic Haplaquod, sandy silicious, thermic (Spodosol)
pH Class: Extremely acid to strongly acid (3.6-5.5)
Moisture Class: Wet, floods, cemented pan.
Community: Pinus serotina, Carolina Bays, and pocosin.

4. Series: Ponzer Muck
Order: Terric Medisaprist, loamy, mixed, dysic, thermic (Histosol)
pH Class: Extremely acid to very strongly acid (3.6-4.5)
Moisture class: ponding, floods, percolates slowly.
Community: Pinus serotina, Carolina Bays.

c. Hydrology Summary

Drainage basin: Core Sound, Thorofare Bay, Long Bay

Hydrologic System: 1. Terrestrial 2. Palustrine

Hydrologic Subsystem: 1. Dry xeric to very dry xeric
2. interaqueous

Water Chemistry: fresh, very strongly acidic to acidic

Water regime: 1. Terrestrial- permanently exposed
2. Non-tidal- semipermanently flooded to saturated.

d. Summary-Topography and Physiography

Topographic site type characteristics: Irregular coastal plain with slight relief

Land form: Carolina bays, relict dunes and swales.

Shelter: open

Aspect: Relict dunes and Carolina bays generally run in a northwest direction. In the southeast section of the area, the dunes run in a northeast direction.

Slope angle: Nearly level 0-2^{o} to gently sloping 2-6^{o}.

Profile: Dune ridges are convex, Carolina bays are concave.

Surface patterns: Swell and swale

Position: Not applicable

Physiographic site type of natural area: Atlantic outer coastal plain. Pleistocene estuarine barrier.

Physiographic site type of community cover type or community type: Relict beach ridges and swales.

Geologic formation: Relict beach ridges and swales, Carolina Bays.

Geologic formation age: Pleistocene. Recent marine quartz sands of a pleistocene barrier "Atlantic Barrier".

References: R.B. Mixon & O.H. Pilkey. 1976. Reconnaissance Geology of the Submerged and Emerged Coastal Plain Province, Cape Lookout Area, N.C. Geol. Survey Prof. Paper 859. U.S. Govt Printing Office. Washington, D.C.

"Atlantic Sand (Pleistocene). Quartz sand, well-sorted; in northeast and central parts of outcrop area, forms northwest-trending beach ridges, average surface elevation is 10 to 15 feet, ranging upward to 20 feet. Southwest part of outcrop area is characterized by lower relief and arcuate, northeast-trending sand ridges; arcs are convex northwestward. Slightly to strongly elliptical northwest-oriented depressions, some with well-developed sand rims and organic fill, truncate beach and dune-ridge topography" (Mixon & Pilkey, 1976, plate 1 .

e. Summary - Endangered and threatened species (see Figure 1)

*Name of species: Fothergilla gardenii

Species legal status: Threatened peripheral

Number of populations on site: only one observed, probably more exist.

Number of individuals per population: only 1 plant observed.

Size or maturity of individuals: Reproductive stage-flowers abundant

Disturbance or threats to population: no known threat

Habitat characteristics:

Vegetation association: wide ecotonal area between longleaf pine ridge and pond pine shrub (pocosin)

Topography: slight slope (to 2°) between relict beach ridge and swale or Carolina Bay.

Soil Series: Murville sand

Drainage basin: Thorofare Bay (via small creeks)

Other plant and animal species present: Pinus palustris, Gaylussacia frondosa, Zenobia pulverulenta, Pinus serotina.

Note: Plant species of special concern:

*Leiophyllum buxifolium: This species is not recognized as threatened in North Carolina, but its presence on the sand ridges southeast of N.C. 12 is very interesting. The nearest counties where it occurs are Brunswick, Bladen and Robeson counties. It appears to be in the same niche as Gaylussacia frondosa on the ridges northwest of N.C. 12.

*Xyris flabelliformis: This species is not threatened, but is listed as rare in moist savannahs and wet ditches in Brunswick, Carteret and Onslow Counties (Radford et al, 1968. Manual of the Vascular Flora of the Carolinas, UNC press). It was found in a ditch along the sand road going into the area northwest of N.C. 12.

*Name of species: Red-Shouldered Hawk

Species legal status: Threatened

Number of populations on site: one

Number of individuals per population: 2 or 3

Size or maturity of individuals: presumed to be adult (nesting is likely)

General vigor of population: unknown

Disturbance or threats to population: no specific threats

Habitat characteristics

Vegetation association: ecotonal area between swamp on northwest boundary of study area and pocosin.

Topography: level to slight slope, 0 - 2°.

Soil Series: Murville sand (flys over other types)

Drainage basin: Thorofare Bay

* Name of Species: Bald Eagle

Species legal status: Endangered

We did not observe this species, but there are a few recent records for the study area or immediately adjacent lands. An adult was observed perched in a tree just southwest of the study area in December 1979 (Kevin Hintsa, pers. com.). The study area, combined with adjacent extensive uninhabited areas, are potential eagle nesting habitat.

*Name of Species: Mountain lion, cougar

Species legal status: Endangered

Neither of us is qualified to evaluate sight records of this species. There is a recent sight record of a mountain lion in this area by a hunter. Identification may or may not have been correct. Nevertheless, any occurrence of this species in the future will be related to the future alteration of presently "wild" land to the west.

*Name of species: Red-cockaded Woodpecker

Species legal status: Endangered

Number of populations on site: Possibly one

Number of individuals per population: possibly 2 or 3 (the species was sighted three times, 2- Feb. 24, 2- Mar. 31, and 1 - May 24.) These records may represent only two individuals.

Size or maturity of individuals: probably adult. Cavity trees may be within the area bounded by the three sightings.

General vigor of population: Extremely small number of individuals, possibility of extirpation in the near future.

Threats to population: Lack of fire management produces a lack of suitable habitat. They probably nest in pond pines.

Habitat characteristics:

Vegetation association: Longleaf pine/shrub, pond pine/shrub

Topography: level to slight slope, relict beach ridges, swales and Carolina Bays.

Soil series: Leon sand, Mandarin sand, Murville sand, Ponzer muck.

Drainage basin: Core Sound, Thorofare Bay, Long Bay

*Name of species: Swallow tailed kite

Species legal status: Undetermined

We did not observe this species but there are two published records - one within the study area in 1978 (Chat 42:62 and Carol Reigle, pers. com.) and one either within the study area or within land adjacent to the study area in 1968 (Chat 32:50).

*Name of Species: Osprey

Species legal status: Of special concern only

There is at least one nest of this species in the study area (see map).

*Name of species: Black-throated Green Warbler

Species legal status: of special concern only

Two singing individuals were seen on May 24. Fussell also has previous record in the area: May 28, 1970 and April 18, 1976.

*Name of Species: Swainson's Warbler

Species legal status: of special concern only

Three singing birds were seen on May 24.

*Name of species: Prothonotary Warbler

Species legal status: Of special concern only

Several territorial individuals were scattered throughout the area on May 24.

*Name of Species: Bachmans Sparrow

Species legal status: Threatened

We did not find this species in 1980. However, Rowlett found two singing birds here in 1972 (Chat 37:33). Perhaps there was more suitable habitat in 1972 because of a previous forest fire.

*Name of Species: Black Bear

Species legal status: of special concern only

We saw no signs of bear, but hunters reported it in the area recently.

*Name of species: Amphibians- Pine Barren Treefrogs and Carolina Gopher Frogs.

During our entire study period, there was not a single heavy rainfall. Thus, we did not have good conditions for finding these amphibians.

Map legend and other details: **(Refer to Map 16 on page 116.)**

A: Fothergilla gardenii (site is approximate)

B: Red-shouldered hawk sighting locations

C: Osprey nest location

D: Red-cockaded woodpecker sighting locations

E: Black-throated green warbler sightings location

F: Swainson's warbler sighting location

Leiophyllum buxifolium is abundant on longleaf pine ridges on the southeast side of N.C. 12.


Solid heavy line denotes highway

Light solid line denotes major jeep trail

Dashed line denotes boundary of study area.


Dotted line denotes general orientation pattern of longleaf pine ridges within different sections of study area; they do not represent individual ridges, but they do show where ridges are most prominent.


Solid area denotes natural pond in Carolina Bay. Borrow pits along jeep trails are not shown on map.


Cross-hatched ellipses denote minimum area of Carolina bays, those highly visible in aerial photographs.

We used the term pocosin to refer to all evergreen shrub bog vegetation other than that which occurs in well-defined bays. Thus the evergreen shrub bog vegetation in flat featureless areas and that in the inter-ridge swales are pocosin.

All of the study area northwest of N.C. 12 (1900 + acres) is part of a larger tract owned by Duke University. All of the study area southeast of N.C. 12 (1000 + acres) is part of a larger tract owned by Sailors Snug Harbor.

f.

Master Species List FLORA

Longleaf pine ridge	L
Carolina Bays, Pososin	P
Hardwood Swamp (nw boundary)	S
Ponds, Borrow pits	po
Weeds (usually associated with trash)	W

Trees

Aceraceae	Acer rubrum	L,P,S
Fagaceae	Quercus laevis	L
	Q. nigra	L,S
	Q. virginiana	L
Lauraceae	Persea borbonia	L,P
	Sassafras albidum	L
Magnoliaceae	Magnolia virginiana	L,P
Nyssaceae	Nyssa sylvatica var. biflora	L,P,S
Pinaceae	Pinus palustris	L
	P. serotina	P
	P. taeda	L
Rosaceae	Malus pumila	L
	Prunus serotina	L
Salicaceae	Salix caroliniana	L,S
Theaceae	Gordonia lasianthus	P

Shrubs

Anacardiaceae	Rhus copallina	L,W
Aquifoliaceae	Ilex coriacea	L,P
	I. glabra	L,P
	I. opaca	L
	I. vomitoria	L
Asteraceae	Baccharis halimifolia	L
Clethraceae	Clethra alnifolia	L,P
Cyrillaceae	Cyrilla racemiflora	L,P

Shrubs		
Ericaceae	Cassandra calyculata	P
	Gaylussacia dumosa	L
	G. frondosa	L
	Kalmia angustifolia var. caroliniana	L,P, L/P
	Leiophyllum buxifolium	L
	Lyonia lucida	P
	L. mariana	L
	Rhododendron atlanticum	P, L/P
	Vaccinium atrococcum	L,P
	V. tenellum	L
	Zenobia pulverulenta	P
Hamamelidaceae	Fothergilla gardenii	P,L/P
Hypericaceae	Hypericum cistifolium	L
	H.reductum	L
	H. stans	L
Myricaceae	Myrica cerifera	L,P,S
	M. cerifera var. pumila	L
	M. heterophylla	P
Rosaceae	Rosa multiflora	L,W
	Sorbus arbutifolia	L,P
Vines		
Convolvulaceae	Calystegia sepium	W
Ericaceae	Vaccinium crassifolium	L, L/P
Fabaceae	Galactia regularis?	L
	Wisteria sinensis	L,W
Liliaceae	Smilax bona-nox	L
	S. glauca	P
	S. laurifolia	P
Loganiaceae	Gelsemium sempervirens	L,P
Rosaceae	Rubus trivialis	L,W
Herbs		
Apiaceae	Hydrocotyle verticillata	po
Araceae	Peltandra virginica	po

Herbs

Asteraceae	Aster linariifolius	L
	A. paludosus	L
	Carphephorus tomentosus	L
	Chondrophora nudata	L
	Eupatorium capillifolium	W
	E. leucolepis	L
	E. recurvans	L,P
	Helianthus angustifolius	L
	Heterotheca gossypina	L
	H. nervosa	L
	Liatris spicata var. resinosa	L
	Pyrrhopappus carolinianus	W
	Solidago fistulosa	L,P
	S. tenuifolia	L
	S. stricta	L
	Trilisa odoratissima	L
	T. paniculata	L
Campanulaceae	Lobelia nuttallii	L
Chenopodiaceae	Chenopodium ambrosioides	W
Cistaceae	Lechea leggettii	L
Droseraceae	Drosera capillaris	P,po
Ericaceae	Monotropa uniflora	L
Eriocaulaceae	Eriocaulon decangulare	P,po
	Lachnocaulon minus	L
Euphorbiaceae	Cnidoscolus stimulosus	L
Gentianaceae	Bartonia verna	L, L/P
	Gentiana autumnalis	L
Haemodoraceae	Lachnanthes caroliniana	P
Haloragaceae	Proserpinaca pectinata	P,po
Iridaceae	Iris verna	L
Lamiaceae	Scutellaria integrifolia	L
Lentibulariaceae	Pinguicula caerulea	P,L/P
	Utricularia inflata var. minor	po
	U. juncea	P
	U. subulata	L
Liliaceae	Zigadenus densus	P

Herbs

Melastomataceae	Rhexia lutea	L
	R. mariana	L,P
	R. petiolata	L,P
Nymphaeaceae	Nymphaea odorata	po
Onagraceae	Ludwigia alterniflora	P
	L. maritima	P, po
Orchidaceae	Calopogon pallidus	L,P
	Cleistes divaricata	L
	Spiranthes vernalis	P
Polygalaceae	Polygala lutea	P,L/P
Primulaceae	Lysimachia loomsii	P
Sarraceniaceae	Sarracenia flava	P,po
	S purpurea	P
Scrophulariaceae	Agalinis obtusifolia	P,L/P
	A. purpurea	P
	A. setacea	L
	Seymeria cassioides	L
Typhaceae	Typha angustifolia	po
	T. latifolia	po
Violaceae	Viola primulifolia	L
Xyridaceae	Xyris caroliniana	L,P
	X. flabelliformis	P, L/P

Brominoids

Cyperaceae	Carex walteriana	P,po
	Eleocharis tuberculosa	P
	Rhynchospora fascicularis	L,P
	Rhynchospora spp.	L,P
Juncaceae	Juncus diffusissimus	P,po
	J. effusus	P,po
	J. scirpoides	L,P
Poaceae	Andropogon scoparius	L
	A. virginicus	L,P
	Aristida stricta	L
	Arundinaria gigantea	L,P
	Eragrostis refracta	L
	Panicum hemitomom	P,po
	P. portoricense	L
	P. spp.	L,P
	Sporobolus poiretii	L

Ferns, Fern allies, Mosses

Blechnaceae	Woodwardia virginica	L,P
Lycopodiaceae	Lycopodium appressum	P
Osmundaceae	Osmunda cinnamomea	P
Pteridaceae	Pteridium aquilinum	L
Sphagnaceae	Sphagnum spp.	P,po

F. Master Species List FAUNA

Amphibians (list may omit a few species)

Southern toad
Oak toad
Southern cricket frog
Green treefrog
Pine woods treefrog
Squirrel treefrog
Little grass frog
Eastern narrow-mouthed toad
Bullfrog
Carpenter frog
Southern leopard frog

Reptiles (list probably omits several species)

Snapping turtle
Eastern mud turtle
Eastern box turtle
Green anole
Skink- Eumeces sp.
Eastern glass lizard
Northern black racer
Rough green snake
Southern copperhead

Birds (list probably omits several species)

Great blue heron
Green heron*
Swallow-tailed kite
Red-shouldered hawk*
Bald eagle
Marsh hawk
Osprey*
Bobwhite*
Mourning dove*
Yellow-billed cuckoo*
Barred owl*
Chuck-wills-widow*
Common nighthawk*
Chimney swift
Common flicker*
Pileated woodpecker*
Red-bellied woodpecker*@
Yellow-bellied sapsucker
Hairy woodpecker
Downy woodpecker
Red-cockaded woodpecker*
Eastern kingbird*
Great crested clycatcher*
Eastern phoebe
Acadian flycatcher*
Eastern wood pewee*
Purple martin
Blue jay*
Fish crow
Carolina chickadee*
Tufted titmouse*
Brown-headed nuthatch*
House wren
Carolina wren*
Gray catbird*
American robin
Wood thrush*@
Eastern bluebird*
Blue-gray gnatcatcher*
Ruby-crowned kinglet
Cedar waxwing
White-eyed vireo*
Prothonotary warbler*
Swainsons warbler*
Northern parula*?
Yellow rumped warbler
Black-throated green warbler*
Yellow-throated warbler*
Pine warbler*
Prairie warbler*
Common yellowthroat*
Yellow-breasted chat*
Hooded warbler*
Eastern meadowlark*
Orchard oriole*
Common grackle*

Birds

Brown-headed cowbird*
Cardinal*
Indigo bunting*
Rugous-sided towhee*
Savannah sparrow
Dark-eyed junco
Field sparrow
Swamp saprrow

Mammals (list may omit several species)

Opossum
Black bear (see previous section)
Raccoon
? Mountain lion (see previous section)
Eastern cottontail
White tail deer

Browns Island

Name of Area: Browns Island

Location Description: Browns Island is located within Straits (the estuary between Harkers Island and the towns of Gloucester and Marshallberg). By water, it lies about ½ mile east of the bridge to Harkers Island. See Map 17.

Topographic Quadrangle: Harkers Island, N.C.

Ownership: Brown family

Report Prepared by: Jeannie Wilson and John O. Fussell, III

Date: May, 1979

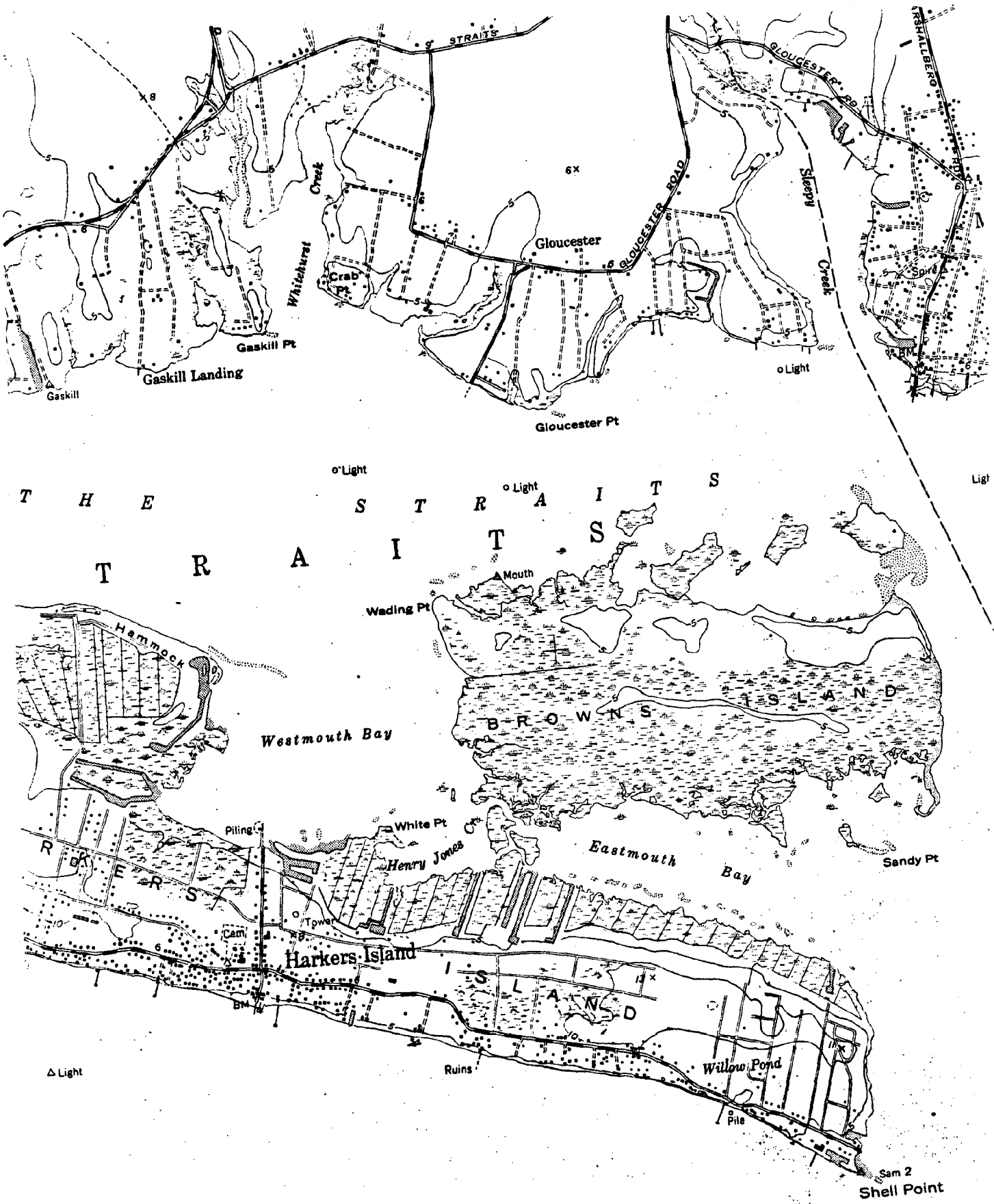
Other Persons Knowledgable about Site:
JoAnne Powell, Hampton Mariners Museum, Beaufort, N.C. 28516
Allyn Powell, National Marine Fisheries, Beaufort, N.C. 28516

Current Use and Protection Status: Currently, Browns Island is in a relatively natural state, although there is at least one homesite on the northeast section of the island. There are evidences of several old homesites on the dune ridges. Cattle, horses and pigs graze on the island now.

The major threat to the area is the plan for development (possibly into a community similar to Hilton Head, SC.) Lots are for sale at the present time. Because the "high" ground is less than 10' in elevation and consists of narrow relict dunes separated by marshes and development would require the filling-in of marshes. The soil is also very low for septic tanks.

Charred tree trunks and stumps indicate the occurrence of fire on the island. The scarcity of Red Cedar (Juniperus virginiana) appears to be due to selective cutting. Otherwise, this species is very common in the area.

Vegetation and Plant Communities: The distinct plant communities of Browns Island are related to slight changes in topography. The south side of the island and the swales between the relict beach ridges consist of salt marshes, dominated by Black needle rush (Juncus roemerianus) and Salt marsh cord grass (Spartina alterniflora). Within the expanse of marsh on the south side is a live oak hammock. Tree stumps are present in the surrounding tidal creeks indicating that the land was probably higher forested ground in the past. The hammock appears to be what is left of a maritime forest. Live oak (Quercus virginiana) is the only tree species present with a number of herbs not found elsewhere in the marsh.



MAP 17: BROWN'S ISLAND

The southermost dune ridge which reaches up to 10' in elevation supports the unique combination of longleaf pine (Pinus palustris), live oak and wiregrass (Aristida stricta). The community has elements of both a longleaf pine sandhills community and a maritime forest. This community probably evolved as such due to the changing nature of the island in relation to salt spray and rising water levels. Evidence of fire is also present here typical of a sandhills community. The northern ridge is similar to the southern ridge except that longleaf pine is not as important as loblolly pine and wiregrass is not very common. More laurel oaks (Quercus laurifolia) are present than live oaks.

In the swale area to the southeast of the northern ridge is a low woodland with elements of a maritime forest and a pocosin. Indicative species are loblolly bay (Gordonia lasianthus), sweet bay (Magnolia virginiana), american holly (Ilex opaca), wild olive (Osmanthus americana), red bay (Persea borbonia), titi (Cyrilla racemiflora), fetterbush (Lyonia lucida), gallberry (Ilex glabra) and wax myrtle (Myrica cerifera).

Saline swale ponds are also present in low areas on the island. The dominant aquatic herb here is Widgeon grass (Ruppia maritima). The north shore of the island exhibits characteristics of an eroding shoreline. In some areas, the vegetation is being undercut by the water. The presence of a swale pond adjacent to the shoreline indicates that it was between two dune ridges at one time. Also, there is a small island to the northeast which was probably connected to Brown's Island in the past.

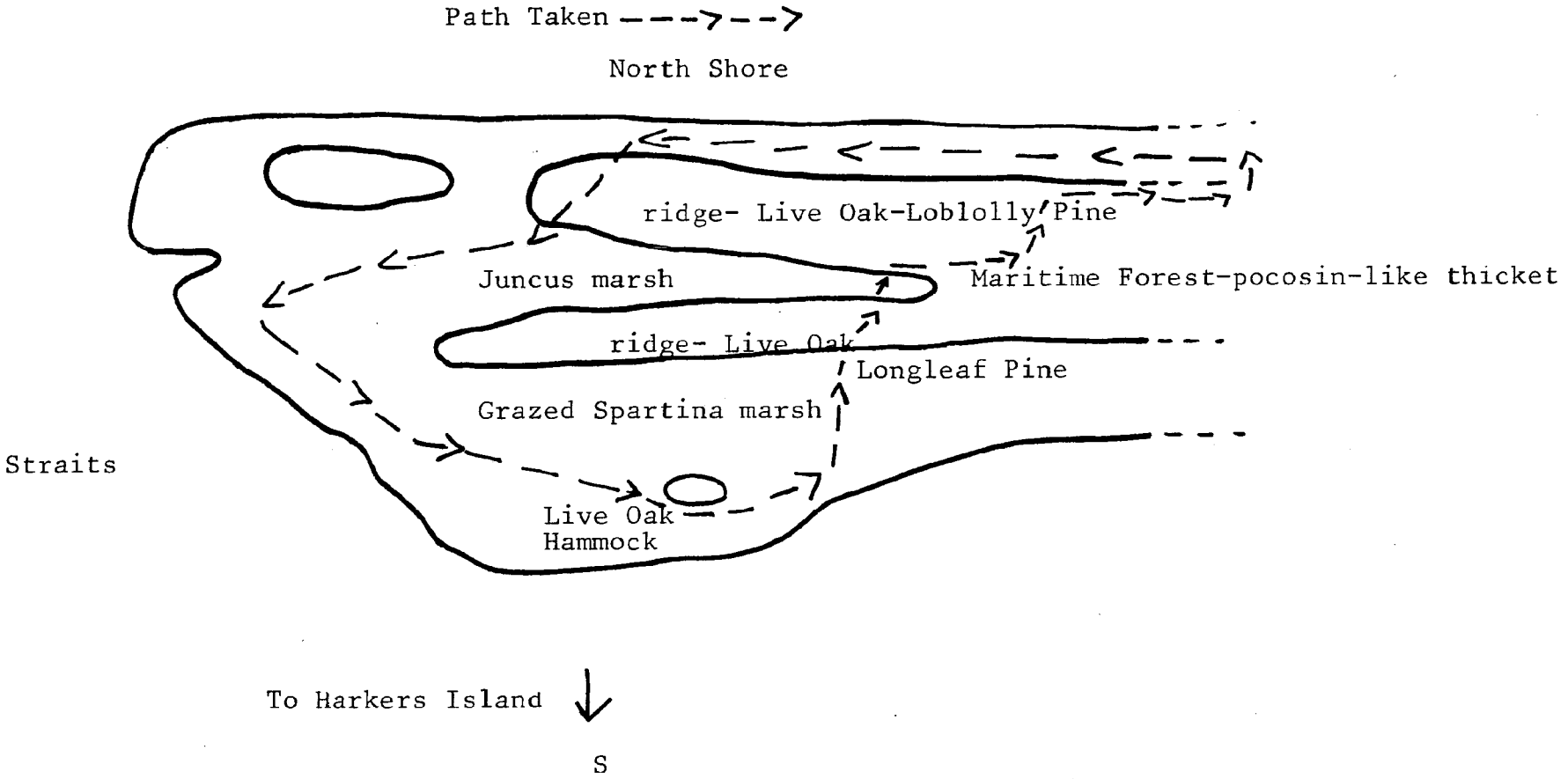
There is one old homesite in the maritime forest on the northwestern portion of the island. Florida pellitory (Parietaria floridana) is growing on the old brick chimney bases, and daffodils are scattered throughout the area.

Physical features: (See Map **18**.) The island consists of a series of relict beach ridges separated by marshes (formerly swale areas). The marshes extend to Harkers Island indicating that perhaps the islands were connected in the past.

The presence of live oaks and stumps in the southern expanse of marsh appears to be a remnant of an earlier maritime forest. The island itself appears to be in a state of change. The forested areas are becoming marsh, leaving only narrow stretches of forest. The dynamic nature of the area is not restricted to the present. During the Pleistocene, Harkers Island (including Browns Island), Beaufort and Morehead City were probably barrier islands (Steve Snyder, Geology graduate student, UNC, Institute of Marine Sciences). Many prominant landforms on inland coastal North Carolina (including scarps) are Pleistocene barriers (Mixon and Pilkey, 1976). It is possible that Browns Island will be a salt marsh in the future with the forces of a rising sea level and erosion that is active on the North Carolina coast.

WESTERN PORTION OF BROWNS ISLAND SURVEYED

Rough Sketch



MAP 18.

Rare Plants and Animals:

Salt Marsh Gerardia	Agaliais Maritina	Endangered peripheral
Creeping Marsh purslane	Ludwigia Repens	Endangered peripheral
Florida pellitory	Parietaria floridana	rare, endemic
Brown Pelican	Pelecanus occidentalis	endangered
Double-crested cormorant	Phalacrocorax auritus floridanus	threatened
Great egret	Casmaeodius albus	special concern
Snowy egret	Egretta (Leucophoyx) thula	special concern
Louisiana heron	Hydranassa tricolor	special concern
Glossy ibis	Plegadis falcinellus	special concern
Black duck	Anas rubripes	special concern
Osprey	Pandion haliaetus	special concern
Gull-billed tern	Gelochelidon nilotica	special concern
Least tern	Sterna albifrons	special concern
Laughing gull	Larus atricilla	special concern
Royal tern	Thalasseus maximus	special concern
Black skimmer	Rhynchops niger	special concern
Yellow-bellied sapsucker	Sphyrapicus varius	undetermined
Black throated green warbler	Dendroica virens	special concern
Prothonotary warbler	Protonotaria citrea	special concern
Carolina salt marsh snake	Natrix sipedon williamengelsi	endemic, undetermined
Outer Banks Kingsnake	Lampropeltis getulus stricticeps	endemic, special concern

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Mixon, R.B. and O.H. Pilkey. 1976. Reconnaissance geology of the submerged and emerged coastal plain province, Cape Lookout area, North Carolina. Geological Survey Professional Paper 859, Govt. Printing Off. Washington, D.C.

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FLORA SPECIES LIST

Salt Marsh:

shrubs:	Baccharis halimifolia	groundsel-tree, silverling
	Borrichia frutescens	sea ox-eye
	Iva frutescens	marsh elder
herbs:	Distichlis spicata	salt grass
	Fimbristylis spadicea	fimbristylis
	Juncus roemerianus	black needle rush
	Limonium carolinianum	sea lavendar
	Salicornia virginica	glasswort, saltwort
	Spartina alterniflora	salt marsh cordgrass
	Agalinis Maritima	salt marsh gerardia

Live Oak Hammock :

Trees:	Quercus virginiana	live oak
Herbs:	Allium bivalve	false garlic
	Centella asiatica	centella
	Cerastium glomeratum	mouse-ear chickweed
	Elephantopus nudatus	elephant's foot
	Geranium carolinianum	cranesbill
	Gnaphalium sp.	cudweed, rabbit tobacco
	Hydrocotyle umbellata	marsh pennywort
	Hypoxis micrantha	yellow stargrass
	Juncus bufonias	rush
	Krigia virginica	dwarf dandelion
	Limonium carolinianum	sea lavendar
	Panicum spp.	panic grass
	Plantago heterophylla	plantain
	P. virginica	plantain
	Rumex hastatulus	sheep sorrel
	Samolus parviflorus	water pimpernel
	Spartina alterniflora	salt marsh cordgrass
	Spergularia marina	sand spurrey
	Stellaria media	chickweed
Vines:	Parthenocissus quinquefolia	virginia creeper
	Rhus radicans	poison ivy
	Rubus trivialis	dewberry

Maritime forest-shrub thicket:

Trees:	Acer rubrum	red maple
	Cornus florida	flowering dogwood
	Gordonia lasianthus	loblolly bay
	Ilex opaca	American holly
	Liquidambar styraciflua	sweetgum
	Magnolia virginiana	sweet bay
	Nyssa sylvatica	black gum
	Osmanthus americana	wild olive
	Persea borbonia	red bay
	Pinus taeda	loblolly pine
	Prunus serotina	wild cherry
	Quercus nigra	water oak

Shrubs:	Amelanchier canadensis	juneberry, serviceberry
	Cyrilla racefiflora	titi
	Gaylussacia frondosa	huckleberry
	Ilex glabra	inkberry, bitter gallberry
	Lyonia lucida	fetterbush
	Myrica cerifera	wax myrtle
	Vaccinium atrococcum	black highbush blueberry
	V. tenellum	lowbush blueberry
	Yucca aloifolia	Spanish bayonet
Herbs:	Andropogon virginicus	broomsedge
	Arundinaria gigantea	cane
	Juncus roemerianus	black needle rush
	Mitchella repens	partridge berry
	Panicum spp.	panic grass
	Pteridium aquilinum	bracken fern
	Samolus parviflorus	water pimpernel
Vines:	Gelsemium sempervirens	yellow jessamine
	Parthenocissus quinquefolia	Virginia creeper
	Rhus radicans	poison ivy
	Smilax laurifolia	bamboo vine
	Smilax walteri	greenbriar, catbriar

Longleaf Pine-Live Oak Woodland:

Trees:	Diospyros virginiana	persimmon
	Ilex opaca	American holly
	Magnolia virginiana	sweet bay
	Osmanthus americanus	wild olive
	Pinus palustris	longleaf pine
	P. taeda	loblolly pine
	Persea borbonia	red bay
	Quercus laurifolia	laurel oak
	Q. virginiana	live oak
Shrubs:	Gaylussacia frondosa	huckleberry
	Ilex glabra	inkberry
	I. vomitoria	yaupon
	Vaccinium tenellum	lowbush blueberry
Herbs:	Andropogon scoparius	little bluestem
	Aristida stricta	wiregrass
	Cerastium glomeratum	mouse-ear chickweed
	Elephantopus nudatus	elephant's foot
	Heterotheca nervosa	camphor weed
	Poa annua	blue grass
	Polypodium polypodioides	ressurection fern
	Pteridium aquilinum	bracken fern
	Xyris caroliniana	yellow-eyed grass
Vines:	Vitis rotundifolia	muscadine grape vine
Epiphytes:	Tillandsia usneoides	Spanish moss

Swale Pond:

Herbs:	Andropogon virginicus	broomsedge
	Distichlis spicata	saltgrass
	Galium obtusum	bedstraw
	Juncus roemerianus	black needle rush
	Ludwigia repens	ludwigia
	Ruppia maritima	widgeon grass

North Shore: swale pond and marsh

Shrubs:	Baccharis halimifolia	groundsel-tree
	Iva frutescens	marsh elder
Herbs:	Atriplex arenaria	seabeach orach
	Cerastium glomeratum	mouse-ear chickweed
	Hydrocotyle umbellata	marsh pennywort
	Juncus roemerianus	black needle rush
	Rumex hastatulus	sheep sorrel
	Ruppia maritima	widgeon grass
	Typha domengensis ?	cat-tail
Vines:	Ipomoea purpurea	common morning glory
	Strophostyles helvola	beach pea

Old Homesite Area:

Trees:	Pinus taeda	loblolly pine
	Quercus laurifolia	laurel oak
	Q. virginiana	live oak
Shrubs:	Asimina parviflora	dwarf paw-paw
	Hypericum hypericoides	St. John's sort
Herbs:	Carduus horridulum	Thistle
	Desmodium sp.	beggar's lice
	Narcissus pseudo-narcissus	daffodil
	Oxalis sp.	sourgrass
	Parietaria floridana	florida pellitory
	Phytolacca americana	poke
	Sanicula sp.	snakeroot
	Viola papilionacea	purple violet
Vines:	Bignonia capreolata	trumpet vine
	Parthenocissus quinquefolia	Virginia creeper
	Rhus radicans	poison ivy
	Smilax auriculata	greenbriar, catbriar
	S. bona-nox	greenbriar, catbriar
Epiphytes:	Tillandsia usneoides	Spanish moss

* probably breeds
\+ possibly breeds

FAUNA OBSERVED 14 APRIL, 1979

Amphibians:

Southern leopard frog	Rana sphenocephala	permanent resident

Birds:

Double-crested cormorant	transient, winter resident
Great egret	perm. resident
Snowy egret	perm. resident
Louisiana heron	perm. resident
Glossy ibis	summer resident
Black duck	+winter resident (summer?)
Red-breasted merganser	winter resident
Osprey	summer resident
American oystercatcher	+perm. resident
Black-bellied plover	transient, winter resident
Whimbrel	transient
Willet	*summer resident
Greater yellowlegs	transient, winter resident
Lesser yellowlegs	transient
Pectoral sandpiper	transient
Least sandpiper	transient
Dunlin	winter resident
Short-billed dowitcher	transient, winter resident
Laughing gull	perm. resident
Great black-backed gull	winter resident
Herring gull	perm. resident
Ring-billed gull	winter resident
Forster's tern	+perm. resident
Least tern	summer resident
Royal tern	summer resident
Black skimmer	perm. resident
Mourning dove	*perm. resident
Yellow-bellied sapsucker	winter resident
Hairy woodpecker	+perm. resident ? or visitor from mainland
Eastern phoebe	transient
Common crow	+perm. res.
Fish crow	+perm. res.
Carolina chickadee	*perm. res.
Carolina wren	*perm. res.
Hermit thrush	winter res.
Blue-grey gnatcatcher	*summer res.
Cedar waxwing	winter res.
Prothonotary warbler	*summer res.
Yellow-rumped warbler (myrtle)	winter res.
Black-throated green warbler	*summer res.
Yellow-throated warbler	*summer res.
Pine warbler	*summer res.
Prairie warbler	*summer res.
Common yellowthroat	+perm. res.? or winter res. only?

Eastern meadowlark	*perm. resident
Red-winged blackbird	*perm. res.
Boat-tailed grackle	*perm. res.
Cardinal	*perm. res.
Rufous-sided towhee	*perm. res.
Savannah sparrow	winter res.
White-throated sparrow	winter res.

Undoubtedly, several other species of waterbirds occur on the island during the course of the year. Clapper rails probably breed on the island. Also, several other landbird species occur during the migrations. The above list probably omits a few summer resident or permanent resident landbird species- Yellow-billed cuckoo, Chuck-wills-widow, Common flicker, Red-bellied woodpecker, Downy woodpecker, Crested flycatcher, Gray catbird, White-eyed virio, Common grackle (one may have been seen 14 April 1979), Seaside sparrow, Swamp sparrow, Song Sparrow, and probably other species occur on the island.

In 1913, Francis Harper called Browns Island an important heronry in the area. He recorded the following birds:

Red-breasted merganser	Roy Brown claimed nesting
American egret (Great)	large heronry- Julian Brown said it was the first time they nested
Louisiana heron	150 at heronry
Little blue heron	350 (nesting?)
Black-crowned night heron	8-10 immatures
Whimbrel	7 birds seen
Flicker	noted as present
Fish crow	200 roosted near heronry
Red-eyed vireo	noted as present
Prothonotary warbler	noted as present
Hooded warbler	noted as present

In 1929, E.E. Brown recorded the following birds on Browns Island (also called Craney Island):

Snowy egret	breeding
Louisiana heron	abundant
Little blue heron	abundant
Black-crowned night heron	immature birds
Hudsonian curlew	2 birds seen
Mourning dove	observed
Brown thrasher	infrequent

Other amphibians that may occur are Squirrel treefrog (Hyla squirella) and Eastern Narrow-mouthed toad (Gastrophryne carolinensis) and Fowlers toad (Bufo woodhousei fowleri).

Reptiles:

No reptiles were observed during the 14 April 1979 visit, perhaps because it was a relatively cold day. However, the Carolina diamondback terrapin (Malaclemys terrapin centrata), Green anole (Anolis carolinensis carolinensis), Six -lined racerunner (Chemidophorus sexlineatus sexlineatus), Eastern glass lizard (Ophisaurus ventralis), Northern Black racer (Coluber constrictor constrictor) certainly occur on the island, as well as perhaps other species.

Two rarer forms that might occur on the island are the Carolina salt marsh snake (Natrix sipedon williamengelsi) which is endemic to coastal North Carolina, and the Outer Banks kingsnake (Lampropeltis getulus sticticeps), endemic to the Outer Banks between Capes Hatteras and Lookout.

Mammals:

Tracks of raccoons (Procyon lotor) were seen on the island. Eastern Moles (Scalopus aquaticus), River Otters (Lutra canadensis), Cottom Mice (Peromyscus gossypinus), and Rice Rats (Oryzomys palustris) probably occur on the island.

Opossums (Didelphis marsupialis), Norway Rats (Rattus norvegicus) and probably one of the rabbits, Marsh Rabbit (Sylvilagus palustris) or Eastern Cottontail Rabbit (Sylvilagus floridanus) may occur on the island.

Also, domestic cows, horses and pigs graze on the marsh grasses and in the woodlands of Browns Island.

Evaluation of the site's ecological significance:

The significant features of Browns Island can be summarized in the following:

1. The island is undeveloped and in a relatively natural state, which is surrounded by developed areas.
2. The dynamic process of natural ecological change is easily illustrated (a former barrier island with relict beach ridges).
3. The unusual plant communities of longleaf pine and live oak (I have personnally never seen the combination before), and a maritime-pocosin-like forest.
4. The presence of the rare Florida pellitory endemic to maritime forests.
5. The presence of 15 bird species which are endangered, threatened or of special concern.
6. The possible presence of endemic reptiles, the Carolina salt marsh snake, and the Outer Banks Kingsnake.

Management Recommendations:

Browns Island does not appear to be very suitable for development because of limited "high" ground. It would seem more suitable as a recreation area or open space rather than residential or commercial sites.

Straits is an important commercial fishing area for the people of Carteret County and is fairly free of pollutants. Heavy development on Browns Island would definitely have an impact.

The grazing by domestic animals has probably had a great impact on the vegetation of the island. The southern Spartina marsh is heavily grazed, but provides better shorebird habitat. The woodlands have been grazed decreasing the amount of undergrowth and diversity of species

Browns Island

Management Recommendations:

In regards to remnant, endangered or threatened species, Browns Island is not particularly notable. The only plant species of concern is the rare endemic, Parietaria floridana, which occurs only in the man-made habitat of old chimney bricks.

Of the birds of special concern, only 4 do or may nest on the island: Black Duck, Osprey, Black-throated Green Warbler, and Prothonotary Warbler. Although the endemic reptiles, the Carolina Salt Marsh Snake and Outer Banks Kingsnake, could occur on the island, their presence has not been documented.

Browns Island's strong points are as a complex natural area and as a unique coastal geologic formation. There are undoubtedly complex biological relationships in a variety of habitats from salt marshes, to forested sand ridges, low woodlands and swale ponds. Although there are no unusual plant species for the area, the plant communities are unique. Elements of inland coastal plant communities appear to be combined with maritime communities. The south ridge is a combination of a longleaf pine-wiregrass community and a live oak maritime forest. The north ridge (or collection of ridges) also has a vegetation type that is neither typical of the mainland nor of maritime communities. Species such as loblolly bay, titi, fetterbush and gallberry are typical of pocosins whereas many of the species are more typical of maritime forests. Also the rarity of red cedar and wild olive, which are common in the Roosevelt Natural Area and Emerald Isle woods on Bogue Banks is notable, even though both areas are similar mesic sites.

The unusual plant communities is a result of a unique coastal geologic formation. The relict beach ridges could be remnants of pleistocene barrier islands or scarps farther inland. Most pleistocene relict beach ridge areas have been altered considerably by man, especially the areas that now comprise islands, such as Roanoke Island and Harkers Island. The dynamic nature of the island suggests a history of rapid geological change. The recent change is towards salt marshes encroaching the forested areas leaving live oak hammocks separated by marsh. Fresh water swale ponds are being encroached by salt water allowing the invasion of species such as Juncus roemerianus. The unusual plant communities and dynamic geological nature may provide clues to the geologic past of North Carolina.

Professional comments:

Dr. Albert E. Radford: Botany Dept. UNC, Chapel Hill,N.C. 27514

The unique vegetation type at Browns Island (Longleaf Pine-wiregrass-Live oak) in a geologically dynamic area , possibly a relict pleistocene scarp, may have statewide significance. He has not seen a community such as this in good condition in North Carolina(although he has not yet visited this site).

JoAnne Powell: Chairman of Environmental Resources Commission Hampton Mariners Museum, Beaufort, N.C. 28516

On a local scale, rapid development in the county has been detrimental to the commercial fishing industry, since many of the marshlands have been distroyed. Leaving a few areas in a natural state is of prime importance to much of the livelihood of county residents. Most of the Brown family wants to sell the land, and would probably not agree to a conservation easement. It may be best to purchase the land by a conservation organization.

Dr. Gene Huntsman: Member of Coastal Resources Commission NOAA, National Marine Fisheries, Beaufort, N.C. 28516

Generically, part of Browns Island is already an "Area of Environmental Concern". The marshes are classified as an AEC, plus a zone of 75' landward from the mean high water level, which places stricter restrictions on development. Proposed land uses cannot significantly harm estuarine resources. Since a majority of Browns Island is already classified as an AEC, restrictions may be imposed on the rest of the island. The only way to include the rest of the island as an AEC is to nominate it based on its being a unique coastal natural area, including rare species or outstanding geological or archeological features.

Recommendations:

The island appears to be significant on the local level and possibly the state level. Since a large portion of Browns Island is already classified as an AEC, development should be controlled for the rest of the island.

If development occurs, the only area of the island that would be suitable is the north ridge, which could accept low density development (few septic tanks). The south ridge (Longleaf pine-Live oak) is not really suitable for development because it is very narrow and surrounded by marsh. Of course, the marshes are not suitable for development, and under no circumstances should they be filled in. The marshes are vital to the commercial fishing industry.

Development would also jeopardize many nesting bird species, including four of special concern. In addition to general disturbance, development could produce a change in habitat conditions, such as filling in of marshes, ponds and low forested areas.

We recommend that all or most of the island be maintained as open space either by local government regulations or by acquisition for a natural area.

Jeannie Wilson
Sept. 19, 1979

Species additions to Browns Island, Carteret County, N.C.

Marsh:

Agalinis maritima
Bacopa monnieri
Pluchea purpurascens

Live Oak Hammock:

Shrubs:
Ilex glabra
Myrica cerifera

Herbs:
Aristida stricta
Lechea leggettii
Lobelia nuttallii
Polygala lutea

Maritime Forest:Shrub thicket

Trees:
Pinus serotina (1 tree seen on the ecotone between the Longleaf Pine-Live Oak woodland and the shrub thicket)

Vines:
Smilax glauca

Herbs:
Rhexia mariana

Longleaf Pine-Live Oak Woodland:

Shrubs:
Myrica cerifera var. pumila
Vaccinium stamineum
Xanthoxylum clava-herculis

Vines:
Vaccinium crassifolium

Swale Pond (edge):

Cyperus sp. (specimen immature to identify)
Rhynchospora fascicularis

Birds:

White-eyed vireo
Red start

Emerald Isle Woods

Name of Area: Emerald Isle, west end of Bogue Banks, N.C.

Location Description: Approximately ¼ mile west of the B. Cameron Langston Bridge on the north and south sides of "Coast Guard Road". The site is immediately west of the electrical substation. See Map 19

Topographic Quadrangle Map Reference: Swansboro

Ownership Information: (See map 20)

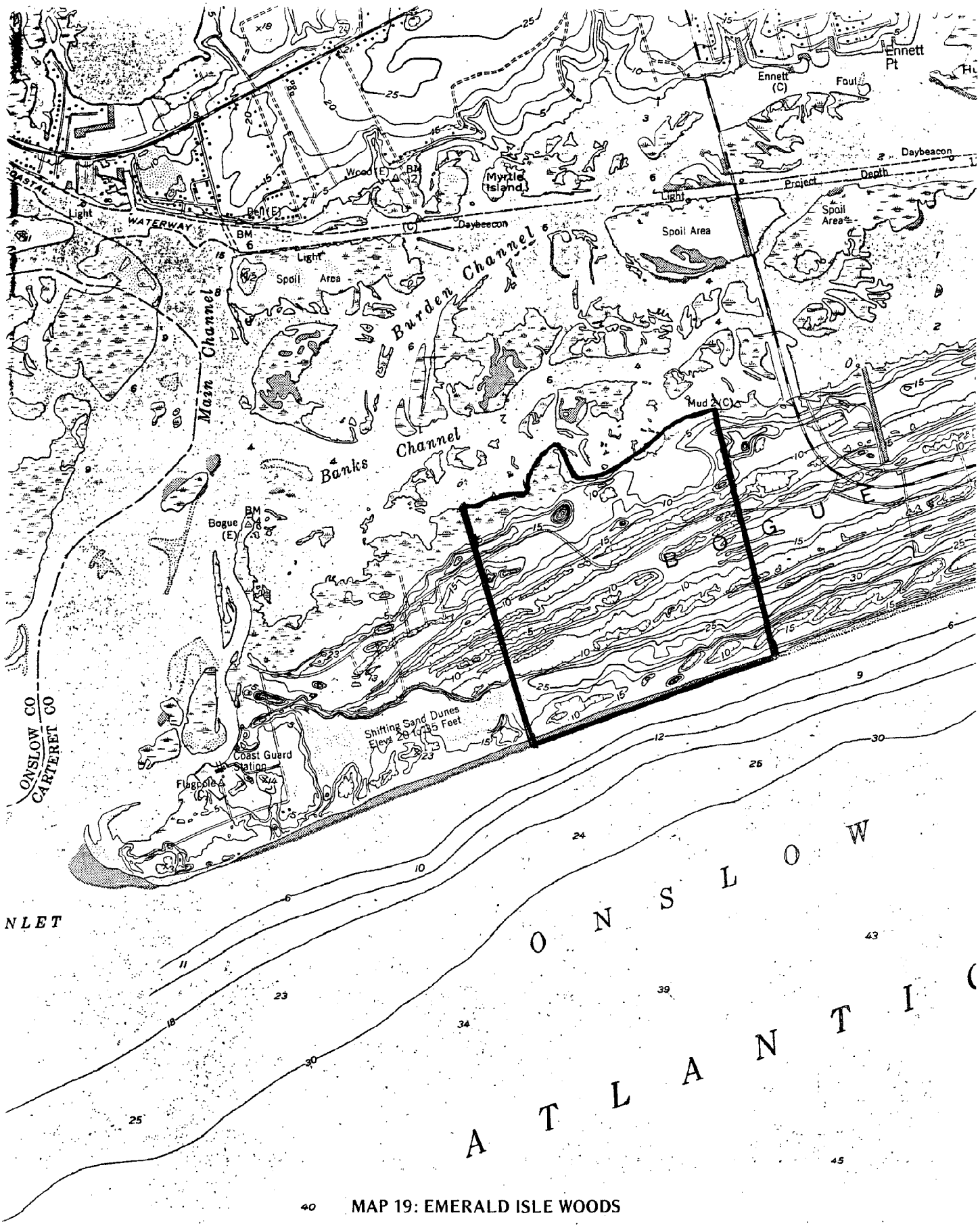
Richard M. White	Emerald Isle	Developer
Lewis R. Holding	Emerald Isle	Developer
James A. Singleton	Singleton Realty	Emerald Isle

Report Prepared by: Jeannie Wilson and John O. Fussell, III

Other Persons Knowledgeable about Site:
Nora Murdock, U.S. Fish & Wildlife Service, Asheville, N.C.
Dave Rackley, U.S. Fish & Wildlife Service, Raleigh, N.C.
Kathryn Henderson, The Nature Conservancy, Chapel Hill, NC

Current Use and Protection Status: Currently, the forest is in an undisturbed and relatively pristine state on the north side of the road. The only signs of human activity here are foot paths that meander through it, some trash and signs of raccoon hunting.

The major and most obvious threat to the area is plans for residential development. Land is now for sale near the electric substation and roadways have been cut through the forest to the ocean on the south side of the road.



MAP 19: EMERALD ISLE WOODS

2 570 000 FEET

SCALE 1:24 000

If it becomes inevitable that development will proceed over the entire area, plans should be made to protect as much of the natural features as possible. These natural features include large 50' relict dunes, swale ponds, large trees, and large primary and secondary dunes. Many of the swale ponds are already being filled in on the south side of the road.

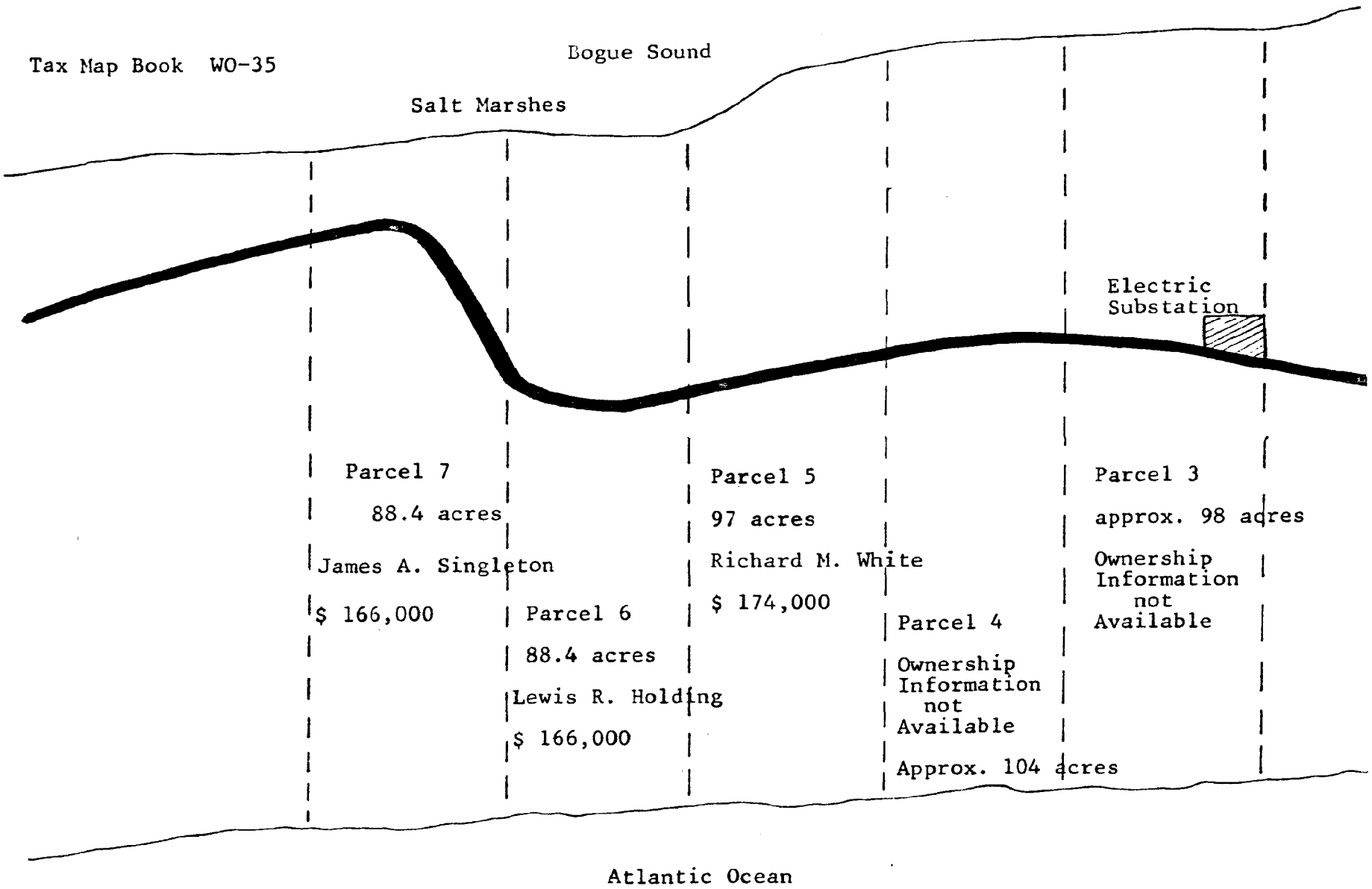
Developers are considering leaving some of the forest on the north side of the road as a greenway area.

Vegetation and Plant Communities: This tract of land is essentially a transect of a barrier island. Large sand dunes (to 35' in elevation) including shifting dunes and stabilized dunes are present near the ocean. The stabilized primary dunes are dominated by Sea oats (Uniola paniculata). The shifting dunes do not have any vegetation cover. The swale between the primary and secondary dune contains a shrub thicket of predominantly wax myrtle (Myrica cerifera), cottonbush (Baccharis halimifolia) and yaupon (Ilex vomitoria). The vegetation cover of the secondary dune is a shrub thicket with dwarf live oak (Quercus virginiana) and many herbaceous species. The live oaks only reach 3' in height due to high winds and salt spray pruning.

There is an abrupt transition into maritime forest behind these high dunes. This maritime forest is unique because of its undisturbed state, the unusually high dune ridges (to 50') and high species diversity relative to its proximity to the ocean. The dominant tree species are laurel oak, red maple, american holly, red cedar, loblolly pine, red bay and ironwood. Many species of shrubs, vines and herbs are also present. Species diversity of plants and animals is high at Emerald Isle because of the forest size and stability.

Large swale ponds occur between the dune ridges. These are freshwater ponds containing many aquatic species such as duckweed (Spirodela and Wolffiella), frog's bit (Limnobium spongia), hornwort (Ceratophyllum demersum), bur-reed (Sparganium americanum) and cat-tail (Typha latifolia). The ponds serve as gathering areas for many animal species as well.

On the north side of the island along Bogue Sound is a thin margin of salt marsh, dominated by Spartina alterniflora and Juncus roemerianus. An extensive patchy salt marsh is present throughout this portion of Bogue Sound.



MAP 20: OWNERSHIP MAP OF EMERALD ISLE NATURAL AREA

Note: Figures represent tax evaluations.

Physical Features:

This section of the barrier island of Bogue Banks is about 3/4 mile wide and is oriented in an east-west direction. Consequently, southwest winds have contributed to the formation of dunes oriented in an east-west to southwest-northeast direction. The dunes range from 10'to 50' in elevation. Between a number of the larger dunes are swale ponds.

The island is somewhat protected from the strong north winds of winter due to the presence of land north of the island. In contrast, Core Banks (Cape Lookout National Seashore) has small unstable dunes due to its north-south orientation and exposure to both northerly and southerly winds. Protection from wind is significant in the formation of large stable dunes and a maritime forest. Therefore, only a few barrier islands in North Carolina have extensive maritime forests.

Rare Plants and Animals:

Plants: none

Reptiles:

Atlantic loggerhead turtle		Caretta caretta caretta
Endangered	occasionally nests on the beach	
American alligator		Alligator mississippiensis
Endangered	possibly occurs here (present in Roosevelt Natural Area)	

Birds:

Red-shouldered hawk		Buteo lineatus
Threatened	probably nests within area	
Merlin		Falco columbarius
Threatened	fall transient	
Peregrine falcon		Falco peregrinus
Endangered	fall transient	

Current use and protection status:

Currently, the forest is in an undisturbed and relatively pristine state on the north side of the road. The only signs of human activity here arefoot paths that meander through it, some trash and signs of raccoon hunting. A steel trap was seen as well as the use of a crab pot with a can of sardines as bait. The crab pot had a dead opossum in it! (Human creativity never ceases to amaze us!). Several hollow trees had been cut (Laurel oaks) indicating that a hunted raccoon had been there. Apparently, raccoon skins are bringing good prices, according to a Fish and Wildlife game warden who was trying to catch a hunter in the Roosevelt Natural Area.

The major and most obvious threat to the area is plans for residential development. Land is now for sale near the electric substation and roadways have been cut through the forest to the ocean on the south side of the road (see photo).

If it becomes inevitable that development will proceed over the entire area, plans should be made to protect as much of the natural features as possible. These natural features include large 50' relict dunes, swale ponds, large trees ,and large primary and secondary dunes. Many of the swale ponds are already being filled in on the south side of the road.

Developers are considering leaving some of the forest on the north side of the road as a greenway area.

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Radford, A.E., H.E. Ahles and C.R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. UNC press, Chapel Hill.

Evaluation of Ecological Significance:

Bogue Banks is one of the few barrier islands in North Carolina with extensive maritime forests. It is also one of the more stable barrier islands in terms of shifting patterns and vegetation, thus lending itself to more development. Because of heavy development on the island, the forest has become a sanctuary for animals at the west end of the island.

An unusual significant feature of the area are the 50' relict dunes which are forested with a mature maritime forest. The large dunes form a protective barrier which allows for the colonization of many plant species which results in a more stablized barrier island. Due to this protection, the forest provides a habitat for plants and animals that normally cannot survive in such close proximity to the ocean.

Several rare and endangered animals occur in this area that are worthy of mention. The Atlantic loggerhead turtle lays eggs on the beaches from June through August. The brown pelican and the peregrine falcon are transient through the area. The red-shouldered hawk probably nests in the area. The american alligator may possibly occur in the area, as they have been seen in the Roosevelt Natural Area.

A question necessary to consider is whether this area is unique or different from other maritime forests in the area, such as Bear Island (Hammocks Beach State Park), Shackleford Banks (part of Cape Lookout National Seashore) and the Roosevelt Natural Area. The dunes are much higher at Emerald Isle than they are in the other forests. The forest seems to be more stable on Emerald Isle, meaning that it is a larger forested area, unstable dunes are not rapidly encroaching on the forest, and the sound is not rapidly eroding the north shoreline. Shackleford forest is being eroded at an alarming rate on the north side. Also, grazing by feral animals has reduced the undergrowth to nearly nothing. The Bear Island forest is rapidly being covered by a very large moving dune. The forest in the Roosevelt Natural Area is very similar to Emerald Isle, although the dunes do not reach that elevation.

In our opinion, Emerald Isle is a significant area, not only for Carteret County, but for the state of North Carolina.

Management Recommendations:

We feel that the Emerald Isle Woods and the adjacent sea oats dunes - together comprising a complete ocean to sound transect of approximately 500 acres - is worthy of preservation. The total extent of maritime forest on the North Carolina coast (and especially Bogue Banks) is rapidly decreasing due to human development and the Emerald Isle Woods is an excellent example of maritime forest. It has a very high plant and animal species diversity and possibly the largest trees and greatest structural diversity of any maritime forest in North Carolina. It certainly has a great deal of esthetic appeal, especially in the areas where relict beach ridges 40 feet and higher alternate with swale ponds. This area also supports several species that are endangered, threatened, or of special concern.

Any degree of human development is inconsistent with the ecological values of the Emerald Isle Woods area. Development would result in the canopy being broken, and thus the forest is no longer a forest. Wide roadways running perpendicular to the beach would channel in salt spray and drying winds. Development would require the fillingin of the swale ponds and development would involve some degree of bulldozing of the forested relict dunes. H abitat for many species would be lost, and this would be especially true for the rarer species.

Of course, development pressure on this area is high, especially on the area south of the road. However, development pressure would be less on the approximately 200 acres that are north of the road. This area is further from the ocean, has the highest relict ridges, has the most swale ponds, and it abuts marshes rather than deep water. Thus development might not proceed here for 3 or 4 years.

The preservation of the 200 acres north of the road would not be as desirable as the preservation of the entire 500 acres, but it would save the best-developed area of forest, a large number of species, and the most prominent area of relict beach ridges and swales.

If the entire 500 acres were acquired for preservation, then steps wouldhave to be taken to protect the dune areas, as from

Management Recommendations:

We feel that the Emerald Isle Woods and the adjacent sea oats dunes - together comprising a complete ocean to sound transect of approximately 500 acres - is worthy of preservation. The total extent of maritime forest on the North Carolina coast (and especially Bogue Banks) is rapidly decreasing due to human development and the Emerald Isle Woods is an excellent example of maritime forest. It has a very high plant and animal species diversity and possibly the largest trees and greatest structural diversity of any maritime forest in North Carolina. It certainly has a great deal of esthetic appeal, especially in the areas where relict beach ridges 40 feet and higher alternate with swale ponds. This area also supports several species that are endangered, threatened, or of special concern.

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Of course, development pressure on this area is high, especially on the area south of the road. However, development pressure would be less on the approximately 200 acres that are north of the road. This area is further from the ocean, has the highest relict ridges, has the most swale ponds, and it abuts marshes rather than deep water. Thus development might not proceed here for 3 or 4 years.

The preservation of the 200 acres north of the road would not be as desirable as the preservation of the entire 500 acres, but it would save the best-developed area of forest, a large number of species, and the most prominent area of relict beach ridges and swales.

If the entire 500 acres were acquired for preservation, then steps wouldhave to be taken to protect the dune areas, as from

Off Road Vehicles, etc. However, forest areas would probably require very little protection from human disturbance, especially if residents of adjacent areas are relatively affluent or retirees.

Flora Species List:

Beach and Dunes

Trees:

Juniperus virginiana	Red Cedar
Prunus caroliniana	Laurel cherry
Quercus virginiana	Live oak
Xanthoxylum clava-herculis	Hercules club, Toothache tree

Shrubs:

Baccharis halimifolia	Groundsel tree, Cottonbush
Croton punctatus	Croton
Ilex vomitoria	Yaupon
Myrica cerifera	Wax myrtle

Vines:

Ampelopsis arborea	Peppervine
Parthenocissus quinquefolia	Virginia creeper
Passiflora lutea	Passion flower
Rhus radicans	Poison ivy
Rubus trivialis	Dewberry
Smilax laurifolia	Bamboo vine
Strophostyles helvola	Wild bean
Vitis rotundifolia	Muscadine grape

Herbs:

Amaranthus pumilus	Seabeach amaranth
Cakile edentula	Sea rocket
Chenopodium ambrosioides	Mexican tea
Erigeron canadensis	Daisy fleabane
Euphorbia polygonifolia	Seaside spurge
Gaillardia pulchella	Gaillardia
Heterotheca subaxillaris	Camphorweed
Hydrocotyle bonariensis	Pennywort
Lepidium virginicum	Poor Man's Pepper
Lippia nodiflora	Capeweed
Oenothera humifusa	Evening primrose
Physalis viscosa ssp. maritima	Ground cherry
Solidago sempervirens	Seaside goldenrod

Graminoids:

Andropogon scoparius	Little blue stem
Panicum spp.	Panic grass
Spartina patens	Saltmeadow hay
Uniola paniculata	Sea oats

Swale Ponds

Trees:

Cornus stricta (edge)	Swamp dogwood
Salix caroliniana	Carolina willow

Shrubs:

Cephalanthus occidentalis	Buttonbush

Vines:

Cuscuta sp.	Dodder
Rhus radicans	Poison ivy

Herbs:

Amaranthus cannabinus	Water hemp
Ceratophyllum demersum	Hornwort
Decodon verticillatus	Water willow, Water loosestrife
Galium hispidulum	Bedstraw
Hydrocotyle verticillata	Pennywort
Limnobium spongia	Frog's bit
Ludwigia palustris	Ludwigia
Polygonum hydropiperoides var. opelousanum	Knotweed
Rumex verticillatus	Swamp dock
Spirodela polyrrhiza	Spirodela, Duckweed
Wolffiella floridana	Duckweed

Graminoids:

Carex comosa	Carex
?Eleocharis baldwinii	Spike rush
Sparganium americanum	Bur-reed
Typha latifolia	Cat-tail

Ferns:

Thelypteris palustris	Marsh fern

Maritime Forest

Trees:

Acer rubrum	Red maple
Carpinus carolinianus	Ironwood
Carya glabra	Pignut hickory
Cornus florida	Flowering dogwood
C. stricta	Swamp dogwood
Ilex opaca	American holly
Juniperus virginiana	Red cedar
Liquidambar styraciflua	Sweet gum
Magnolia virginiana	Sweet bay
Nyssa sylvatica	Black gum
Osmanthus americana	Wild olive (large to 10" diam)
Persea borbonia	Red bay
Pinus taeda	Loblolly pine
Quercus laurifolia	Laurel oak
Q. virginiana	Live oak
Salix caroliniana	Carolina willow
Sassafras albidum	Sassafras (large to 10" diam)

Shrubs:

Aralia spinosa	Hercules club
Euonymus americanus	Strawberry bush
Hamamelis virginiana	Witch hazel
Hypericum hypericoides	St. John's wort
Ilex glabra	Inkberry, bitter gallberry
I. vomitoria	Yaupon
Lyonia lucida	Fetterbush
Myrica cerifera	Wax myrtle
Prunus caroliniana	Carolina cherry
Rhus copallina	Winged sumac
Vaccinium arboreum	Sparkleberry
V. atrocossum	Black highbush blueberry
V. tenellum	Blueberry
Yucca gloriosa	Yucca

Vines:

Ampelopsis arborea	Peppervine
Berchemia scandens	Rattan vine
Gelsemium sempervirens	Yellow jessamine
Parthenocissus quinquefolia	Virginia creeper
Rhus radicans	Poison ivy
Rubus trivialis	Dewberry
Smilax auriculata	Greenbriar, Catbriar
S. bona-nox	Greenbriar, Catbriar
S. glauca	Greenbriar, Catbriar
S. laurifolia	Bamboo vine
S. rotundifolia	Greenbriar, Catbriar
Vitis rotundifolia	Muscadine grape

Epiphytes:

Phoradendron serotinum	Mistletoe
Tillandsia usneoides	Spanish moss

Herbs:

Arisaema triphyllum	Jack-in-the-pulpit
Aureolaria virginica	False foxglove
Conopholis americana	Squaw root
Decodon verticillatus	Water loosestrife
Galium hispidulum	Bedstraw
Hydrocotyle verticillatus	Pennywort
Lemna perpusilla	Duckweed
Limnobium spongia	Frog's bit
Mitchella repens	Partridge berry
Monotropa uniflora	Indian pipe
Spiranthes vernalis	Spring ladies tresses
Tipularia discolor	Crane fly orchid

Graminoids:

Carex comosa	Carex
C. lupulina	Carex
Cyperus spp.	Cyperus
Panicum commutatus	Panic grass
Panicum spp.	Panic grasses
Scirpus cyperinus	Scirpus
S. validus	Scirpus
Uniola laxa	Uniola

Ferns:

Asplenium platyneuron	Ebony spleenwort
Botrychium dissectum	Common grapefern
Osmunda regalis var. spectabilis	Royal fern
Polypodium polypodioides	Resurrection fern
Pteridium aquilinum	Bracken fern
Woodwardia areolata	Netted Chain fern

Salt Marsh

Shrubs:

Baccharis halimifolia	Groundsel tree, Cottonbush
Borrichia frutescens	Sea oxeye

Herbs:

Aster subulatus	Marsh aster
Limonium carolinianum	Sea lavendar
Solidago sempervirens	Seaside goldenrod

Graminoids:

Elymus virginicus	Rye grass
Fimbristylis spadicea	Fimbristylis
Juncus roemerianus	Black needlerush
Panicum virgatum	Panic grass
Spartina alterniflora	Salt marsh cord grass
S. patens	Salt meadow hay

Fauna Species List

Amphibians:

*Eastern spadefoot toad	Scophiopus holbrooki holbrooki
Southern toad	Bufo terrestris
Green treefrog	Hyla cinerea
Squirrel treefrog	Hyla squirella
Eastern narrow-mouthed toad	Gastrophryne carolinensis
Southern Leopard frog	Rana utricularia

Reptiles:

**American alligator	Alligator mississippiensis
*Snapping turtle	Chelydra serpentina serpentina
Eastern mud turtle	Kinosternon subrubrum subrubrum
*Eastern box turtle	Terrapene carolina carolina
Northern diamondback terrapin	Malaclemys terrapin centrata
**Yellow-bellied turtle	Chrysemys scripta scripta
*Atlantic loggerhead turtle	Caretta caretta caretta (occasionally nests on the beach)
Green anole	Anolis carolinensis carolinensis
Six-lined racerunner	Cnemidophorus sexlineatus sexlineatus
*Ground skink	Leiolopisma laterale
*S.E. Five-lined skink	Eumeces inexpectatus
Eastern glass lizard	Ophisaurus ventralis
Banded water snake	Natrix fasciata fasciata
*Eastern ribbon snake	Thamnophis sauritus sauritus
Eastern hognose snake	Heterodon platyrhinos
**Pine woods snake	Rhadinaea flavilata
Northern black racer	Coluber constrictor constrictor
**Eastern coachwhip snake	Masticophis flagellum flagellum
*Rough green snake	Opheodrys aestivus
Greenish rat snake	intergrade between Elaphe obsoleta quadrivittata X E. obsoleta obsoleta

* Probably occurs
** Possibly occurs

Reptiles:

**Northern scarlett snake	Cemophora coccinea copei
Southern copperhead	Agkistrodon contortrix contortrix
Eastern cottonmouth	Agkistrodon piscivorous piscivorous
Canebrake rattlesnake	Crotalus horridus atricaudatus

Mammals:

Opossum	Didelphis marsupialis
Raccoon	Procyon lotor
*River otter	Lutra canadensis
Gray fox	Urocyon cinereoargenteus
Eastern grey squirrel	Sciurus carolinensis
*Cotton mouse	Peromyscus gossypinus
*Rice rat	Oryzomys palustris
Marsh rabbit	Sylvilagus palustris
Whitetail deer	Odocoileus virginianus

* Probably occurs

** Possibly occurs

Birds:

Species	Primary Status	Primary Habitat
Common loon	winter resident	ocean
Red-throated loon	winter resident	ocean
Horned grebe	winter resident	ocean
Pied-billed grebe	winter resident	marshes
Brown pelican	permanent resident	ocean
Gannet	winter resident	ocean
Double-crested cormorant	winter resident	ocean
Great blue heron	permanent resident	marshes
Green heron	summer resident-nests	marshes, ponds
Little blue heron	permanent resident	marshes
Great egret	permanent resident	marshes
Snowy egret	permanent resident	marshes
Louisiana heron	permanent resident	marshes
Black-crowned night heron	permanent resident	marshes
Yellow-crowned night heron	summer resident	marshes
Least bittern	summer resident-nests	marshes
White ibis	permanent resident	marshes
Black duck	winter resident	marshes
Wood duck	winter resident	ponds
Bufflehead	winter resident	sound
Surf scoter	winter resident	ocean
Black scoter	winter resident	ocean
Hooded merganser	winter resident	ponds, marshes
Red-breasted merganser	winter resident	ocean
Sharp-shinned hawk	fall transient, winter res.	forest
Red-shouldered hawk	perm. res. probably nests	forest
Marsh hawk	winter resident	marshes
Osprey	summer resident-may nest	sound
Peregrine Falcon	falltransient	flying over
Merlin	fall transient	flying over
American kestrel	winter resident	dunes
Clapper rail	perm. res.-nests	marshes
Common gallinule	transient	ponds
American oystercatcher	perm. res.	marshes
Semipalmated plover	transient	marshes, beach
Piping plover	transient	beach
Black-bellied plover	transient, wint. res.	beaches
Ruddy turnstone	transient	beach
American woodcock	wint. res. or perm. res. may nest some years	forest
Whimbrel	transient	beach
Willet	perm. res.	beaches
Greater yellowlegs	transient	marshes
Red knot	transient	beach
Least sandpiper	transient	beach
Dunlin	wint. res.	beach, marshes

Species	Primary Status	Primary Habitat
Short-billed dowitcher	transient, wint. res.	marshes
Semipalmated sandpiper	transient	beach
Western sandpiper	trans., wint. res.	marshes, beach
Sanderling	wint. res.	beach
Great black-backed gull	wint. res.	ocean
Herring gull	wint. res.	ocean
Ring-billed gull	wint. res.	ocean
Laughing gull	trans., summer res.	ocean
Bonaparte's gull	wint. res.	ocean
Gull-billed tern	summer res.	beach, dunes
Forster's tern	wint. res.	ocean
Common tern	summer res.	ocean
Least tern	summer resident	sound
Royal tern	perm. res.	ocean
Sandwich tern	transient	ocean
Caspian tern	fall transient	marshes
Black tern	transient	ocean
Black skimmer	perm. res.	sound
Mourning dove	perm. res.-nests	dunes, shrub-forest edge
Yellow-billed cuckoo	sum. res.-prob. nests	forest
Screech owl	perm. res.-nests	forest
Chuck-will's widow	prob. sum. res.-nests	forest
Whip-poor-will	fall transient	forest
Common nighthawk	summer resident	flys over
Ruby-throated hummingbird	sum. res.-prob. nests	forest
Belted kingfisher	wint. res.	sound
Common flicker	fall trans, wint. res. perm. res.? may nest	forest edge
Red-bellied woodpecker	perm. res.-nests	forest
Yellow-bellied sapsucker	wint. res.	forest
Downy woodpecker	prob. perm. res. may nest	forest
Eastern kingbird	Summer res. may nest	forest
Great crested flycatcher	summer res.-nests	forest
Eastern phoebe	fall trans, wint. res.?	forest edge
Tree swallow	primarily fall. trans.	--
Bank swallow	fall transient	--
Rough-winged swallow	summer res.	--
Barn swallow	summer res.	--
Purple martin	summer res.	--
Blue jay	perm. res.-nests	forest
Common crow	prob. perm. res. may nest	beach,dunes, forest
Fish crow	perm. res.-may nest	beach, dunes, forest
Carolina chickadee	perm. res.-nests	forest
Red-breasted nuthatch	prob. wint. visitant	forest
House wren	fall trans., wint. res.	shrub thicket, forest edge
Winter wren	prob. wint. res.	forest
Carolina wren	perm. res.-nests	forest

Species	Primary Status	Primary Habitat
Long-billed marsh wren	fall trans.	marshes
Mockingbird	perm. res.-nests	shrub thicket
Gray catbird	primarily wint. res.	forest edge
Brown thrasher	primarily wint. res.	forest edge
American robin	wint. visitant	forest
Hermit thrush	wint. res.	forest
Blue-gray gnatcatcher	summer res.-prob. nest	forest
Golden-crowned kinglet	wint. visitant	forest
Ruby-crowned kinglet	wint. res.	forest
Water pipet	winter visitant	sound beach
Cedar waxwing	winter res.	forest
White-eyed vireo	summer res.-nests	forest
Solitary vireo	wint. res.	forest
Red-eyed vireo	summer res.-nests	forest
Black and white warbler	transient	forest
Prothonotary warbler	summer res.-nests	forest
Orange-crowned warbler	winter res.	forest
Northern parula warbler	summer res.-nests	forest
Yellow-rumped warbler	winter res.	forest
Black-throated green warbler	poss. sum. res. may nest	forest
Yellow-throated warbler	summer res-nests	forest
Blackpoll warbler	transient	forest
Pine warbler	summer res. or perm. res.- may nest	forest
Prairie warbler	summer res.-nests	shrub thicket
Palm warbler	trans., wint. res.	shrub thicket
Common yellowthroat	trans., wint. res.	shrub thicket
American redstart	fall transient	forest
Red-winged blackbird	perm. res.-nests	shrub-thicket
Orchard Oriole	summer res.-nests	forest edge
Boat-tailed grackle	perm. res.	marshes
Common grackle	summer res.-nests	forest
Brown-headed cowbird	early sum. res. breeds, doesn't nest	roadsides
Summer tanager	summer res.-nests	forest
Cardinal	perm. res.-nests	forest
Indigo bunting	summer res.-nests	forest edge
Painted bunting	summer res.-nests	forest edge
American goldfinch	wint. res.	dunes, forest
Rufous-sided towhee	perm. res.-nests	shrub thicket
Savannah sparrow	wint. res.	dunes
Sharp-tailed sparrow	wint. res.	marshes
Seaside sparrow	perm. res.	marshes
Dark-eyed junco	winter visitant	forest edge
White-throated sparrow	wint. res.	forest edge
Fox sparrow	wint. visitant	forest edge
Swamp sparrow	wint. res.	forest edge
Song sparrow	wint. res.	forest edge

Hadnot Creek on White Oak River

Name of Area: Hadnot Creek on the White Oak River

Location Description: Hadnot Creek is a tributary of the White Oak River. The creek crosses N. C. 58 about 3 miles south of Kuhns, near Hadnot Road. See Map 21.

Topographic Quadrangle Map Reference: Maysville 1:62500

Ownership: Croatan National Forest (northeast section)
c/o District Ranger
435 Thurman Road
New Bern, NC 28560

Mr. & Mrs. Stephen Warner (southwest section and
Hadnot Creek Farm, N. C. 58 mouth of creek)
Swansboro, NC 28584

The Mower Lumber Company
not a local company
owns 359 acres of forest, and 41 acres of cleared land.

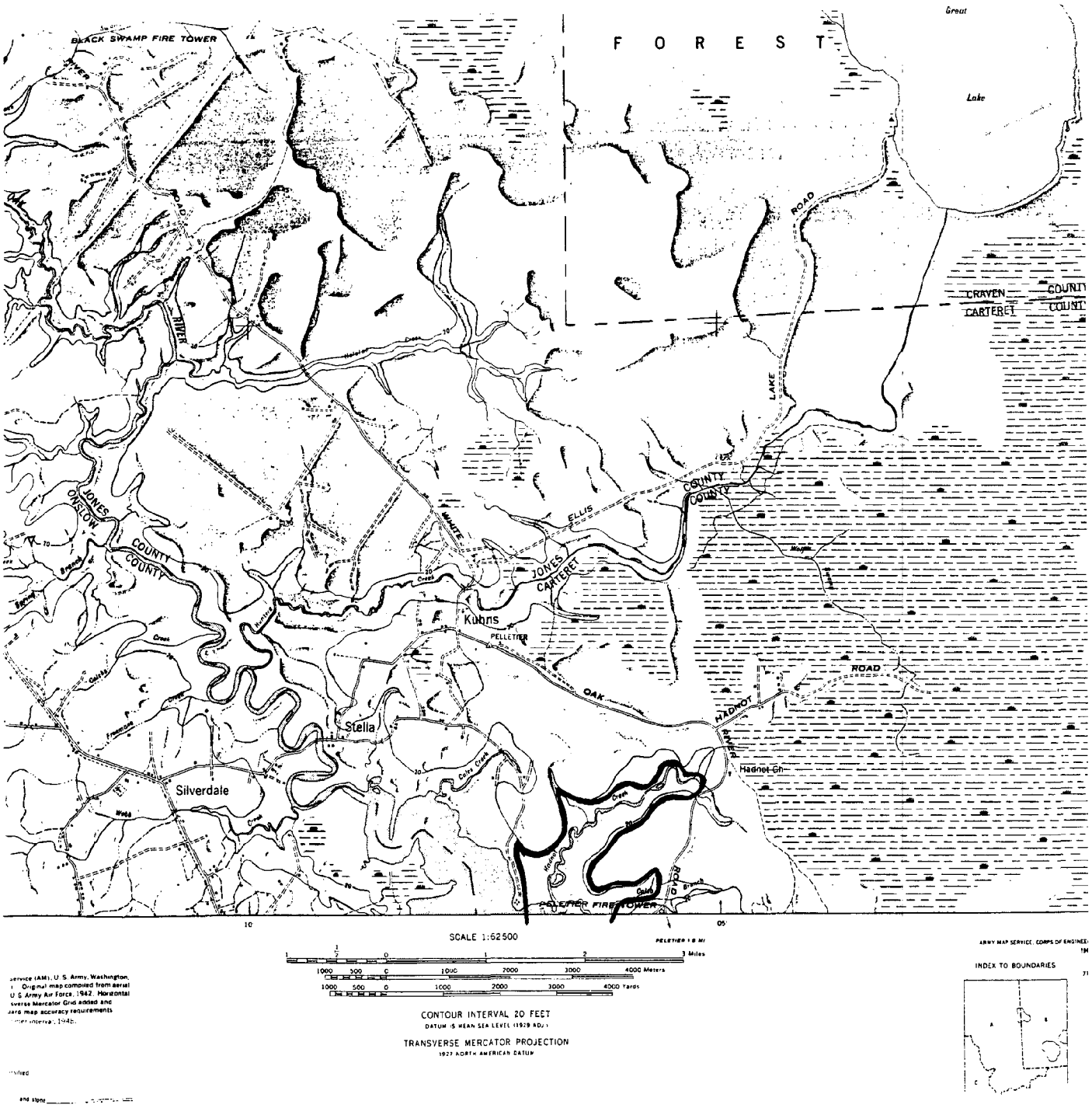
The creek east of the N. C. 58 bridge is administered by Inland Fisheries (freshwater) and west of the bridge is administered by Marine Fisheries.

Report prepared by: Jeannie Wilson and Manley Fuller

Date: July, 1978

Current Use and Protection Status:

Currently, the creek is in a natural state and relatively undisturbed state, as is the entire White Oak River. Hunting and fishing are the primary activities along this tributary. Evidence of disturbance includes a hardwood timber cut on a section of bluff, as well as secondary forest growth along most of the bank and bluff. Since most of the land is owned by a lumber company, there is the potential for extensive logging in the future. Luckily, the Warners, who own the land at the creek's mouth, are interested in land conservation. Because the entire White Oak system of creeks and the river is relatively undisturbed, it should be preserved as a whole unit. The gradation from brackish to fresh water is quite striking in terms of vegetation changes (see Holston Creek report). The area has proved to be an excellent area for scientific and educational endeavors. The presence of the endangered American Alligator also warrants its protection. The Warners have registered their portion of Hadnot Creek as a protected North Carolina Natural Heritage Area.



MAP 21: HADNOT CREEK

Vegetation and Plant Communities:

Hadnot Creek is a brackish water creek which encompasses several distinct plant communities. The primary communities include brackish marshes, a brackish island, cedar hummocks, and a combination of hardwood-pine stands.

Brackish Marshes: The marshes and the creek exhibit varying degrees of salinity from the mouth to the head of the creek, as shown by several species. Spartina alterniflora is common near the mouth of the creek where the salinity is higher, and Scirpus americanus, Cladium jamaicense, and Spartina cynosuroides become abundant toward the head of the creek, where the salinity is lower. Common species along the marshes include the following:

Spartina alterniflora
S. patens
S. cynosuroides
Scirpus americanus
Cladium jamaicense
Juncus roemerianus
Hibiscus moscheutos
Disticlis spicata
Typha latifolia
Typha angustifolia
Oenothera fruticosa
Rumex verticillatus
Pontederia cordata
Myosotis laxa
Solidago sempervirens
Senecio glabellus
Ipomoea pandurata

Small brackish island (Pork Chop Island) along the north shore of the creek: This island is relatively unique, because of the presence of an extensive matformer, Lilaeopsis chinensis. Common species are:

Lilaeopsis chinensis
Ptilimnium capihlaceum
Eleocharis albida
Eleocharis sp.
Baccharis halimifolia

Cedar Hummocks: These are possibly the result by some dredging that may have occurred to keep the creek open to small boat traffic. Common species are:

Juniperus virginiana
Sabal minor
Ilex vomitoria
Rhus radicans
Myrica cerifera
Baccharis halimifolia
Rosa palustris
Osmunda regalis var. spectabilis

Pteridium aquilinum
Polypodium polypodioides
Vitis aestivalis
Usnea sp.

Forest Types: The mixed-hardwood and pine forest is the dominant type along the creek bank and bluff, although Beech and Bald Cypress appear infrequently. Beech occurs infrequently on protected bluffs, and Cypress appears occasionally along the creek margin, where the salinity has dropped to a low level. Common forest trees are:

Acer rubrum
Carya pallida
Fagus grandifolia
Juniperus virginiana
Liquidambar styraciflua
Liriodendron tulipifera
Fraxinus caroliniana
Magnolia virginiana
Persea borbonia
Pinus taeda
Stewartia malacodendron
Taxodium distichum
Ilex opaca
Ostrya virginiana
Pinus taeda

Unlike most brackish creeks in the area, Hadnot Creek is relatively undisturbed, and very few dwellings or buildings are found along it. In this regard, this creek is unique for Carteret County.

Physical Features: The creek meanders southwest and empties into the south-flowing White Oak River. Along the margins of the creek is a 20' bluff over marl (limestone), supporting a mixed hardwood forest.

Rare Plants and Animals:

Chinese Lilaeopsis	Lilaeopsis chinensis locally abundant; rare.
American Alligator	Alligator mississippiensis probably breeds in area; endangered

References:

Kuenzler, E. J. 1976. unpublished class notes from Wetlands Ecology Class, UNC Institute of Marine Sciences.

Radford, A. E. et al, 1968. Manual of the Vascular Flora of the Carolinas. UNC Press, Chapel Hill.

Recorded Flora

Aceraceae	Acer rubrum	f
Alismataceae	Sagittaria falcata	m
Amaranthaceae	Amaranthus cannabinus	m
Anacardiaceae	Rhus copallina	h,f
	R. radicans	h,f
	R. toxicodendron	f
	R. vernix	f
Annonaceae	Asimina parviflora	f
Apiaceae	Centella asiatica	m
	Lilaeopsis chinensis	m
	Ptilimnium capillaceum	m
Aquifoliaceae	Ilex glabra	h,f
	I. opaca	f
	I. vomitoria	f
Araliaceae	Aralia spinosa	f
Arecaceae	Sabal minor	h
Aristolochiaceae	Hexastylis arifolia	f
Asclepidaceae	Asclepias lanceolata	f
	A. tuberosa	f
Aspleniaceae	Asplenium platyneuron	f
Aspidiaceae	Athyrium asplenioides	f
Asteraceae	Baccharis halimifolia	h
	Borrichia frutescens	m,h
	Elephantopus tomentosus	f
	Eupatorium sp.	f
	Senecio glabellus	m
	Solidago sempervirens	m
Betulaceae	Ostrya virginiana	f
Blechnaceae	Woodwardia areolata	f
Bignoniaceae	Anisostichus capreolata	f
Boraginaceae	Myosotis laxa	m

m - marsh
h - hummock
f - forest
a - aquatic

Bromeliaceae	Tillandsia usneoides	f
Convolvulaceae	Ipomoea pandurata	m
Cornaceae	Cornus florida	f
Cucurbitaceae	Melothria pendula	f
Cupressaceae	Juniperus virginiana	f
Cyperaceae	Cladium jamaicense	m
	Eleocharis albida	m
	Eleocharis sp.	m
	Scirpus americanus	m
	S. robustus	m
Ebenaceae	Diospyros virginiana	f
Ericaceae	Epigaea repens	f
	Gaylussacia frondosa	f
	Leucothoe racemosa	f
	Oxydendrum arboreum	f
	Rhododendron nudiflorum	f
	Vaccinium arboreum	f
	V. stamineum	f
	V. vacillans	f
Fabaceae	Clitoria mariana	f
	Lespedeza spp.	f
Fagaceae	Fagus grandifolia	f
	Quercus alba	f
	Q. nigra	f
	Q. stellata	f
	Q. velutina	f
	Q. virginiana	f
Hamamelidaceae	Hamamelis virginiana	f
	Liquidambar styraciflua	f
Hippocastanaceae	Aesculus pavia	f
	Castanea pumila	f
Hypericaceae	Hypericum hypericoides	f
Juncaceae	Juncus effusus	m
	J. roemerianus	m
Juglandaceae	Carya pallida	f
	C. tomentosa	f
	Juglans nigra	f

Lauraceae	Persea borbonia	f
	Sassafras albidum	f
Liliaceae	Smilax bona-nox	f
	S. laurifolia	m
	S. rotundifolia	h,f
	S. walteri	m
	Yucca filamentosa	f
Loganiaceae	Gelsemium sempervirens	f
Magnoliaceae	Liriodendron tulipifera	f
	Magnolia virginiana	f
Malvaceae	Hibiscus moscheutos	m,h
Moraceae	Broussonetia papyrifera	f
	Morus rubra	f
Myricaceae	Myrica cerifera	h,f
Najadaceae	Najas guadalupensis	a
Nyssaceae	Nyssa sylvatica var. biflora	f
Oleaceae	Fraxinus caroliniana	f
	Osmanthus americana	f
Onagraceae	Oenothera fruticosa	m
Osmundaceae	Osmunda cinnamomea	f
	O. regalis var. spectabilis	h
Pinaceae	Pinus taeda	f
	Tsuga canadensis-planted on Warner property	
Poaceae	Arundinaria gigantea	f
	Distichlis spicata	m
	Panicum spp.	h,f
	Phragmites communis	m
	Spartina alterniflora	m
	Spartina cynosuroides	m
	S. patens	m
Polygonaceae	Polygonum sp.	h
	Rumex verticillatus	m
Polypodiaceae	Polypodium polypodioides	h,f
Pontederiaceae	Pontederia cordata	m
Pteridaceae	Pteridium aquilinum	h,f
Rosaceae	Prunus caroliniana	f
	Rosa palustris	m
Ruppiaceae	Ruppia maritima	a

Salicaceae	Salix caroliniana	m
Scrophulariaceae	Aureolaria virginica	f
Styracaceae	Styrax grandifolia	f
Symplocaceae	Symplocos tinctoria	f
Taxodiaceae	Taxodium distichum	f
Theaceae	Stewartia malacodendron	f
Typhaceae	Typha angustifolia	m
	T. latifolia	m
Verbenaceae	Callicarpa americana	f
Vitaceae	Ampelopsis arborea	h,f
	Parthenocissus quinquefolia	h,f
	Vitis aestivalis	h
	V. rotundifolia	f
Usneaceae	Usnea sp. (lichen)	h

Recorded Fauna

Mammals	Raccoon
	Bob Cat (heard by Manley Fuller summer 1977)
Reptiles	American Alligator
Birds	Cardinal
	Carolina Chickadee
	Yellow-billed cuckoo
	Common egret
	Black crowned night heron
	Bob white quail
	Rough winged swallow
	White eyed virio
	Parula warbler
	Pine warbler
	Prairie warbler
	Prothonotary warbler
	Yellow bellied sapsucker

Hadnot Creek Ponds and Longleaf Pine Woodlands

Name of Area: Hadnot Creek Ponds and Longleaf Pine Woodland (Upstream)

Location: In vicinity of intersection of U.S. Forest Service Roads 182 and 200. (See Map 22.)

Quadrangle: Maysville

Date: November 20, 1980

Investigator: John Fussell

Physical/Habitat Feature: Freshwater ponds and longleaf pine woodland.

Survey Priority: Medium (see comments)

Site Quality: Some longleaf pine trees are mature; Red-cockaded woodpecker cavity trees are present.

Elevation: Ca. 25-40'

Topography: Nearly level

Soil Series: Area not yet mapped by Soil and Conservation Service.

Size: Ca. 210 acres

Geological Formation: May be within or on periphery of Flanner Beach Formation. (See Mixon, R. and O. Pilkey. 1976. Reconnaissance Geology of the Submerged and Emerged Coastal Plain Province, Cape Lookout Area, North Carolina. U.S. Geol. Survey Prof. Paper 859.)

Drainage: Hadnot Creek to White Oak River

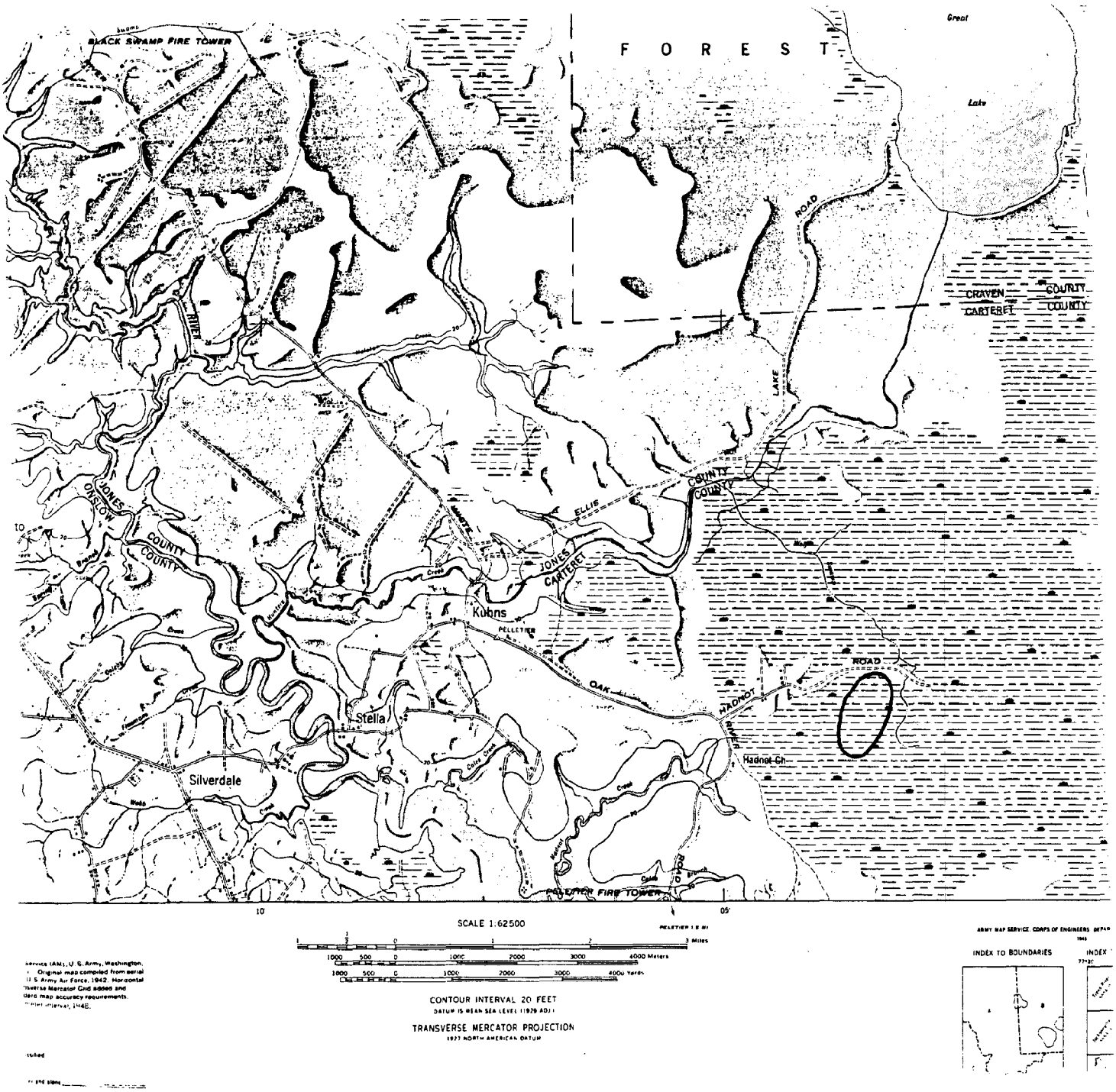
E & T Species Present: 5+ Red-cockaded woodpecker cavity trees seen. At least 2 of these were currently active.

Potential for E & T Species: See comments.

Site Integrity: Some of the longleaf pine woodland has been clearcut within last 10 years.

Owners: USDA, Forest Service

Other Knowledgeable Persons: U.S. Forest Service



MAP 22: HADNOT CREEK PONDS AND LONGLEAF PINE WOODLAND

Comments

The primary purpose of this visit was to see the ponds that are evident on aerial photographs. Within the tract that includes the ponds (ca. 210 acres), there is open longleaf pine woodland, a small area of pocosin, a small area of loblolly pine forest, and some clearcut areas. Of these, the ponds and the longleaf pine woodland are of primary interest.

Some of the ponds appear to be naturally impounded remnants of former drainage systems. Others, though, appear to be "sinkholes". In any event, they represent an unusual concentration of freshwater ponds in this county.

The ponds are generally small (largest seen ca. 200' across) and shallow (less than 2' deep). They appear to have been dry during the summer and fall and had little vegetation in them. However, it seems likely that some rare plant species might occur here. These ponds are in the corner of the county closest to the known range of the pine barrens treefrog and it is possible that that species occurs here.

Most of the longleaf pine woodland has a fairly pure growth of longleaf pine. It grows up to 70' tall with a DBH of 12"+. There is little understory. Ilex glabra often dominates the ground cover. Aristida stricta is generally sparse; the area would benefit from more frequent fire management. Two active red-cockaded woodpecker cavity trees were seen; the area is marginal habitat for Bachman's sparrows, but none were seen.

This area should be considered at least of medium priority. The concentration of freshwater ponds (especially when surrounded by longleaf pine woodland) is unusual. The "sinkhole" appearance of some adds to their geological significance. The longleaf pine woodland is one of the better examples of this community in the county and it harbors at least one endangered species.

Additional geological and botanical work on the ponds might reveal that the area is of high priority.

Species lists

PLANTS

Trees

Acer rubrum
Liquidambar styraciflua
Magnolia virginiana
Nyssa sylvatica var. biflora
Persea borbonia
Pinus palustris
Pinus serotina
Pinus taeda
Quercus laevis
Quercus laurifolia
Sassafras albidum

Shrubs

Cyrilla racemiflora
Gaylussacia dumosa
Ilex coriacea
Ilex glabra
Lyonia lucida
Lyonia mariana
Myrica cerifera var. pumila
Vaccinium atrococcum
Vaccinium crassifolium

Herbs

Carphephorus sp.
Centella asiatica
Drosera sp.
Liatris sp.
Polygala cymosa
Proserpinaca pectinata
Solidago sp.

Graminoids

Andropogon virginicus
Aristida stricta
Arundinaria gigantea
Juncus sp.
Panicum hemitomon
Scirpus cyperinus

Vines

Smilax laurifolia

Ferns and allies

Lycopodium sp.
Pteridium aquilinum
Sphagnum sp.
Woodwardia virginica

ANIMALS

Birds

Wood duck
Sharp-shinned hawk
Mourning dove
Common flicker
Pileated woodpecker
Downy woodpecker
Red-cockaded woodpecker
Eastern phoebe
Brown-headed nuthatch
House wren
Eastern bluebird
Golden-crowned kinglet
Ruby-crowned kinglet
Yellow-rumped warbler
Pine warbler
Palm warbler
Song sparrow

Masontown Pocosin

Name of Area: Masontown Pocosin

Location: Tract of pocosin lying NW of community of Masontown which is about two miles NW of Town of Newport. Pocosin is bounded on the east by the Atlantic and East Carolina Railroad, and the west by the Lake Road (SR 1125). See Map 23.

Quadrangle: Masontown

Date: October 28, 1980

Investigator: John Fussell (Report by Fussell and Jeannie Wilson)

Physical/Habitat Feature: Pocosin

Survey Priority: Medium $\pm$ tract includes a large area of pocosin and a significantly large area of low pocosin.

Site Quality: Pinus serotina are very small; age is unknown. This is a relatively large tract of low pocosin (ca. 1200+ acres) and relatively large tract of high and low pocosin combined (ca. 4800 acres).

Elevation: ca. 25-28'

Topography: flat, featureless

Soil Series: Only the southern border of the large pocosin area has been mapped. Consists of a combination of Croatan Muck, Pantego fine sandy loam, and Torhunta fine sandy loam. SCS, USDA, 1979. Carteret County Soil Survey, Interim Report. (Jeannie Wilson)

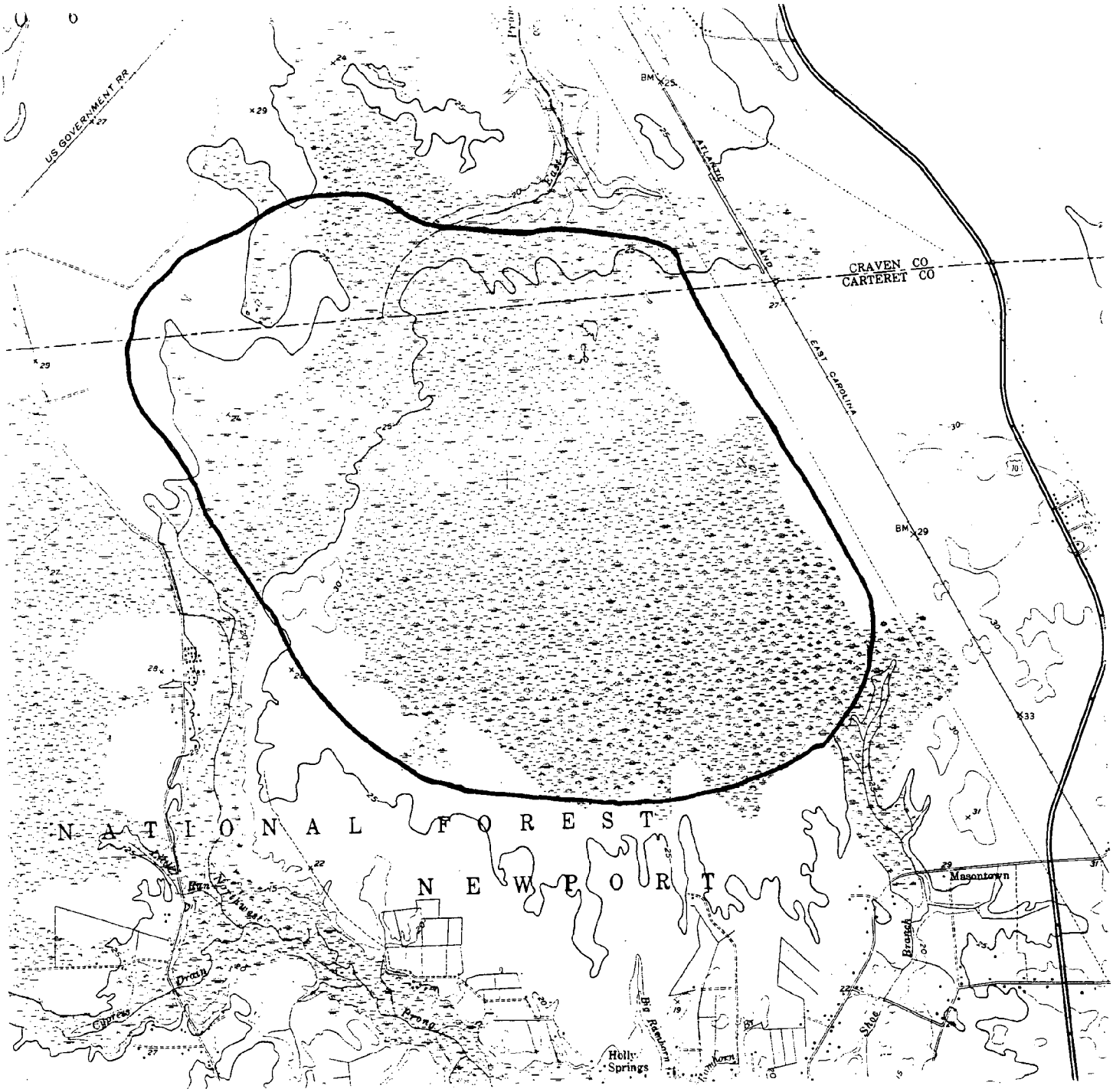
Size: total pocosin 4800 acres
low pocosin 1200 acres
All low pocosin is in Carteret County; approximately one third of total pocosin in Craven.

Geological Formation: Flanner Beach Formation, Pleistocene
Mixon, R.B. & O.H. Pilkey. 1976. Reconnaissance Geology of the Submerged and Emerged Coastal Plain Province, Cape Lookout Area, U.S. Geol. Survey Prof. Paper 859. US Govt. Print. Off.

Drainage: North section of pocosin drains northward into tributaries of Slocum Creek. South section drains southward into tributaries of Newport River.

E & T Species Present: none observed

Potential for E & T Species: See additional page.



MAP 23: MASONTOWN POCOSIN

Site Integrity: There are no drainage ditches or other human encroachments within the tract. Tracks from a large ORV (probably Forest Service) transect the tract.

Owners: USDA, Forest Service, Croatan National Forest

Other Knowledgeable Persons: none known

Other Comments: This tract is notable for having a rather large area of low pocosin.

DOMINANT VEGETATION: Only the central low pocosin area of the tract was analyzed. This area is roughly rectangular, ca. 1.75 x 1.10 miles, the long axis NW-SE. The mass of shrub vegetation is less than two feet high and is dominated by Lyonia lucida and Zenobia pulverulenta. Pinus serotina (ca. 15' tall) are scattered very sparsely throughout. Small "clumps" (ca. 20' X 20') of larger broadleaf evergreens (to 6-8' high) are scattered at 100'-200' intervals. These are dominated by Gordonia lasianthus, Cyrilla racemiflora, Lyonia lucida, Myrica heterophylla, and Smilax laurifolia. Carex walteriana and Sphagnum sp. are abundant throughout the area. Cassandra calyculata is also frequent throughout, and Eriophorum virginicum is fairly common where the mass of vegetation is less than a foot or so.

POTENTIAL FOR ENDANGERED AND THREATENED SPECIES: Although the pond pines are very small, much of this area appears to be structurally suitable for red-cockaded woodpeckers. American alligators occur in the pocosin west of the Lake Road, and may occur in this pocosin occasionally. Black bears, now considered to be of special concern status, may be considered threatened in the future. They undoubtedly occur in this pocosin. (They are rather common in the pocosin west of the Lake Road.)

PLANTS OBSERVED (Species list is for low pocosin species only.)

Trees: Gordonia lasianthus (primarily in "clumps"), Magnolia virginiana (few), Persea borbonia (mostly "clumps"), Pinus serotina (small, very sparse).

Shrubs: Cassandra calyculata (common), Cyrilla racemiflora (common), Ilex glabra (common), Lyonia lucida (abundant; with Zenobia, forms bulk of low growth), Myrica heterophylla (mostly restricted to "clumps"), Sorbus arbutifolia (few), Zenobia pulverulenta (common).

Vines: Smilax laurifolia (common)

Herbs: Sarracenia flava (few)

Graminoids: Andropogon virginicus (scattered in low growth areas), Arundinaria gigantea (few; more common toward high pocosin), Carex walteriana (abundant), Eriophorum virginicum (fairly common)

Ferns: Woodwardia virginica (fairly common)

Moss: Sphagnum sp. (abundant)

ANIMALS OBSERVED

Reptiles: Rough green snake

Birds: Short-billed marsh wren (one), House wren, Gray catbird, Yellow-rumped warbler.

Mammals: Whitetail deer

North River Marshes

Name of Area: North River Marshes

County: Carteret

Location Description: In this report, the North River marshes are considered to be all the marshes on the west side of North River that lie between the U. S. 70 bridge on the north and Fulcher Creek on the south. Their extent is approximately 1½ miles by 1/3 mile. See Map 24.

Topographic Quadrangle Map Reference: Williston, N. C.

Ownership: Seven private owners.

Report Prepared By: Jeannie Wilson and John Fussell, III

Date: July, 1979

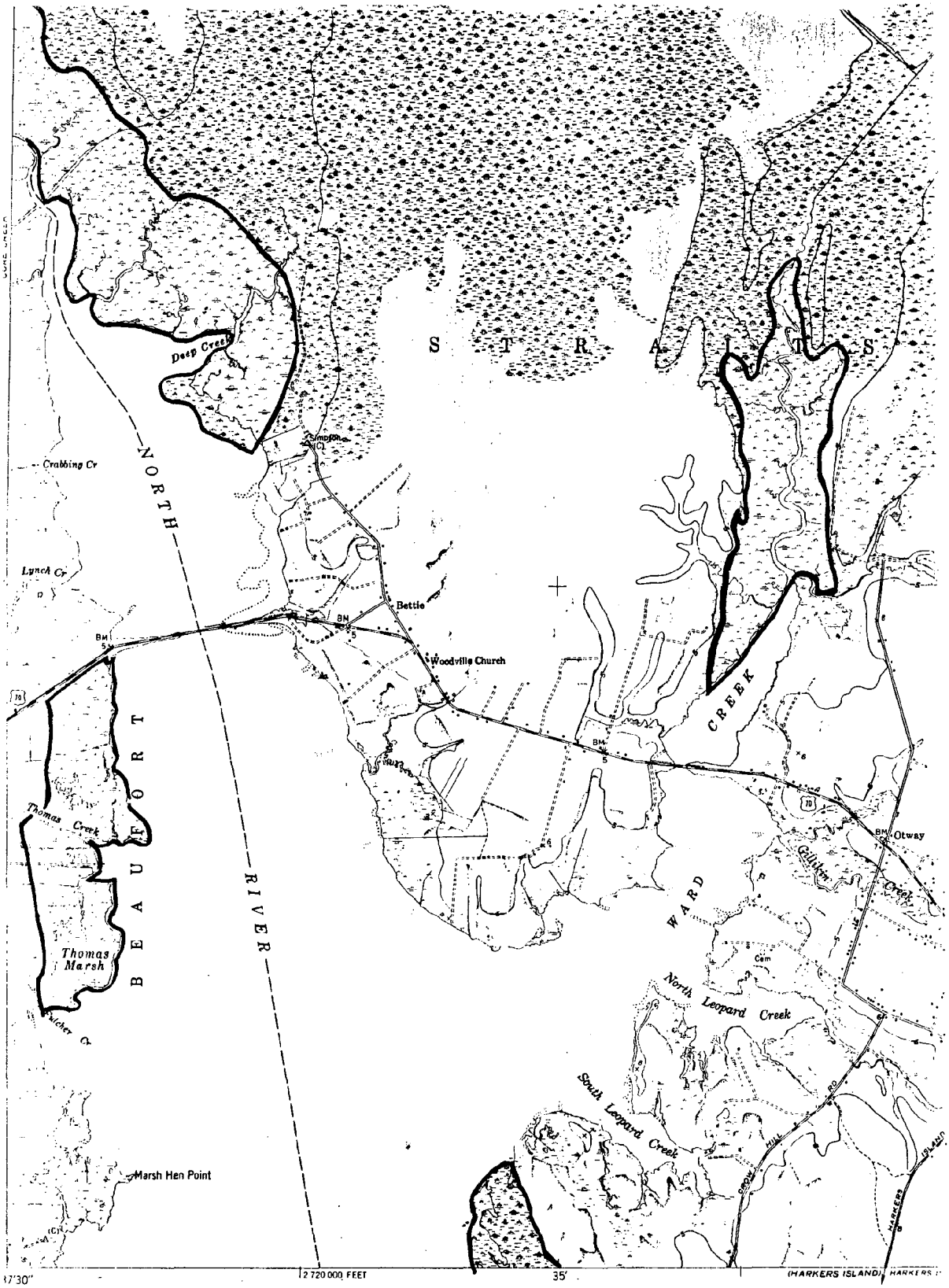
Other Knowledgeable Persons:

JoAnne Powell
Hampton Mariners Museum
Beaufort, NC 28516

T. L. Quay
Dept. of Zoology
NCSU
Raleigh, NC 27607

Current Use and Protection Status:

North River marshes are important nursery areas for many of North Carolina's fish and shellfish as well as an important nesting and feeding ground for many shorebirds. This portion of the marsh is transected by three drainage ditches used in mosquito control. One roadway in the marsh leads to the house owned by Mr. Van Dooren. The north half of the area is currently used as a grazing pasture for cattle which primarily feed on Salt Marsh Cordgrass (Spartina alterniflora).



Mapped by U. S. Coast & Geodetic Survey
Edited and published by the Geological Survey

Control by USC&GS (C) and USED (E)

Culture and drainage in part compiled from aerial photographs taken 1946
Topography by plane-table methods 1947. Field check 1949

Polyconic projection. 1927 North American datum
10,000-foot grid based on North Carolina coordinate system

Unchecked elevations are shown in brown

SCALE 1:24000

1000 0 1000 2000 3000 4000 5000

CONTOUR INTERVAL 5 FEET
DATUM IS MEAN SEA LEVEL

SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HI
THE AVERAGE RANGE OF TIDE IS APPROXIMATELY 2.5 FEET

4½° TRUE NORTH MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1949

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STAN

MAP 24: NORTH RIVER MARSHES

FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTO
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILA

The grazing has created a better habitat for shorebirds.

North River has been used for many years for scientific research projects on fish and shellfish, particularly by National Marine Fisheries in Beaufort. The marshes are also used for educational purposes. Biology classes from East Carteret High School conduct field trips and the Hampton Mariners Museum conducts bird-watching trips in this area.

Major direct threats to the area include filling-in, ditching, and pollution. Pollution from the North River community has probably been the cause for the adjacent estuary being closed to shellfishing.

Vegetation and plant communities:

North River marshes consist of a variety of microhabitats caused by small topographic changes. This "high" marsh is infrequently inundated by tidal water. Because of this, the short form of Spartina is present. Much of the Spartina has been grazed by cattle, but the Spartina is still short in ungrazed areas. Black needlerush (Juncus roemerianus) occurs along the landward side. Shallow pools are scattered throughout the marsh. Toward the north is a chain of pools (to approximately 6") that are surrounded by black needlerush. Salt pans, or slightly elevated areas in the marsh, contain glasswort (Salicornia virginica) an d other herbs.

On the margins of the drainage ditches, where spoil has been placed, are shrubs such as sea ox-eye (Borrichia frutescens), wax myrtle (Myrica cerifera), cottonbush (Baccharis halimifolia) as well as several small loblolly pines (Pinus taeda).

Physical features:

North River marsh occurs along the west side of North River. The marsh is irregularly inundated by tidal water, producing a short and sparse population of cordgrass (Spartina alterniflora) . Small topographic differences, such as small pools and salt pans affect the zonation of vegetation.

Rare Plants and Animals:

COMMON NAME	SCIENTIFIC NAME	STATUS
Great Blue Heron	Ardea herodias	Special concern
Great Egret	Casmerodius albus	Special concern
Snowy Egret	Egretta (Leucophoyx) thula	Special concern
Louisiana Heron	Hydranassa tricolor	Special concern
Black-crowned Night Heron	Nycticorax nycticorax hoactli	Special concern
Yellow-crowned Night Heron	Nyctanassa violacea	Special concern
Least Bittern	Ixobrychus exilis exilis	Threatened
American Bittern	Botourus lentiginosus	Undetermined (as a breeding species)

Rare Plants and Animals:

COMMON NAME	SCIENTIFIC NAME	STATUS
Glossy Ibis	Plegadis falcinellus	Special concern
White Ibis	Guara alba	Special concern
Black Duck	Anas rubripes	Special concern
Osprey	Pandion haliaetus	Special concern
Marsh Hawk	Circus cyanus hudsonius	Undetermined (as a breeding species)
Black Rail	Laterallus jamaicensis pygmaeus	Undetermined
Laughing Gull	Larus atricilla	Special concern
Gull-billed Tern	Gelochelidon nilotica aranea	Special concern
Common Tern	Sterna hirundo hirundo	Special concern
Least Tern	Sterna albifrons	Special concern
Black Skimmer	Rhynchops niger	Special concern
Barn Owl	Tyto alba pratincola	Special concern
Purple Martin	Progne subis subis	Special concern
American Alligator	Alligator mississippiensis	Endangered
* Black-necked Stilt	Himantopus mexicanus	Not listed as rare

or endangered but is generally uncommon in North Carolina, very local. Rarely nests out of the Bodie Island - Pea Island area.

Historical Significance:

The North River marshes have been known to ornithologists since the turn of the century. It was apparently here, in 1898, that the eminent ornithologist T. Gilbert Pearson collected the first North Carolina specimen of White Ibis. White Ibises were rare in the state at that time.

The Van Dooren house was a state oyster experiment station from 1940 to 1942, closed because of World War II. Experimental oyster beds were in the marshes. Since then, oyster research has been taken over by the UNC Institute of Marine Sciences, National Marine Fisheries, and N.C. Division of Marine Fisheries (Dr. Al Chestnut, UNC Institute of Marine Sciences, Personal Communication).

Publications and Scientific References:

Cooper, John E. (et. al.) (Eds.) 1977. Endangered and Threatened Plants and Animals of North Carolina. N.C. Museum of Natural History, Raleigh.

Richert, Jon E. Sr. 1978. A Guide to North American Bird Clubs. Avian Publications, Inc. Elizabethtown, Kentucky (Hampton Mariners Museum bird trips list North River marsh as a popular bird watching spot).

Fussell, John O. III. 1969 -1971. Systematic bird censuses of North River marsh (plus additional censuses to 1979) unpublished.

FAUNA SPECIES LIST

Birds that occur regularly in the North River marshes:

1. This list includes birds that occur (feed in or over the marsh) regularly in the marsh proper. Birds of the adjacent open estuary, adjacent wooded areas, and rarities not sighted every year are excluded from the list.
2. For bre vity, status listed is a short approximation. Water birds often do not fit well into a transient-summer resident; winter resident-permatent resident grouping.
3. List is based primarily on over two years (1969-1971) of systematic censuses of the marsh conducted at approximately three week intervals at all seasons, plus numerous additional censuses to 1979.

SPECIES-COMMON NAME	PRIMARY STATUS	BREEDS
Pied-billed Grebe	winter resident	
Great Blue Heron	permanent resident	
Green Heron	summer resident	
Little Blue Heron	permanent resident	
Great Egret	permanent resident	
Snowy Egret	permanent resident	
Louisiana Heron	permanent resident	
Black-crowned Night Heron	permanent resident	
Yellow-crowned Night Heron	summer resident	
Least Bittern	summer resident	yes, apparently
American Bittern	winter resident	
Glossy Ibis	summer resident	
Shite Ibis	summer resident	
Mallard	permanent resident	yes
Black Duck	permanent resident	yes
Green-winged Teal	winter resident	
Blue-winged Teal	transient	
Hooded Merganser	winter resident	
Red-breasted Merganser	winter resident	
Osprey	summer resident	
Marsh Hawk	winter resident	
Clapper Rail	permanent resident	yes
Virginia Rail	winter resident	
Sora	winter resident	
Black Rail	permanent resident	
American Oystercatcher	permanent resident	
Semipalmated Plover	transient	
Killdeer	winter resident	
Black-bellied Plover	transient	
Ruddy Turnstone	transient	
Common Snipe	transient-winter resident	
Whimbrel	transient	

SPECIES-COMMON NAME	PRIMARY STATUS	BREEDS
Spotted Sandpiper	transient	
Willet	summer resident	yes
Greater Yellowlegs	transient-winter resident	
Lesser Yellowlegs	transient	
Pectoral Sandpiper	transient	
White-rumped Sandpiper	transient	
Least Sandpiper	transient	
Dunlin	transient-winter resident	
Short-billed dowitcher	transient-winter resident	
Long-billed dowitcher	transient	
Stilt Sandpiper	transient	
Western Sandpiper	transient-winter resident	
Black-necked Stilt	summer resident	yes
Herring Gull	winter resident	
Ring-billed Gull	winter resident	
Laughing Gull	transient-summer resident	
Gull-billed Tern	summer resident	
Forster's Tern	summer resident	apparently, some years
Common Tern	summer resident	
Least Tern	summerresident	
Caspian Tern	transient	
Black Skimmer	summer resident	
Barn Owl	winter resident	
Common Nighthawk	summer resident	
Belted Kingfisher	winter resident	
Tree Swallow	transient	
Rough-singed Swallow	summer resident	
Barn Swallow	summer resident	
Purple Martin	summer res ident	
Fish Crow	permanent resident	
Long-billed Marsh Wren	permanent resident	yes
Short-billed Marsh Wren	winter resident	
Yellow-rumped Warbler (Myrtle)	winter resident	
Palm Warbler	transient	
Bobolink	transient	
Eastern Meadowlark	permanent resident yes	
Red-winged Blackbird	permanent resident	yes
Boat-tailed Grackle	permanent resident	
Savannah Sparrow	winter resident	
Sharp-tailed Sparrow	winter resident	
Seaside Sparrow	summer resident	yes

Birds that occur occasionally in the North River marshes:

The ducks listed above are the only species that occur regularly. Gadwall, Pintail, American Wigeon and Northern Shoveler are occasional. The adjacent North River sometimes has large numbers of other ducks, such as Redhead, Scaup, Ruddy Ducks and Buffleheads. Sharp-shinned Hawks, Red-tailed Hawks, American Kestrels, and Great Horned Owls probably feed in the marsh on occasion. Some notable rarities at North River marshes in the last ten years are Roseate Spoonbill, Peregrine Falcon, Merlin, American Golden Plover, and Wilson's Phalarope.

	COMMON NAME	SCIENTIFIC NAME
Amphibians:	**Southern Leopard Frog (May occur along the landward side of the marsh)	Rana utricularia
Reptiles:	**American Alligator	Alligator mississippiensis
	*Snapping Turtle	Chelydra serpentina serpentina
	Carolina Diamondback Terrapin	Melaclemys terrapin centrata
Mammals:	*Opossum	Diadelphis marsupialis
	Raccoon	Procyon lotor
	*River Otter (John Fussell says that he has seen at least one)	Lutra canadensis
	Gray Fox	Urocyon cineroagenteus'
	*Rice Rat	Oryzomys palustris
	Marsh Rabbit	Sylvilagus palustris

** possibly occurs
* probably occurs

FLORA SPECIES LIST

Trees:	Loblolly Pine	Pinus taeda
Shrubs:	Cottonbush, Groundsel tree	Baccharis halimifolia
	Sea Ox-eye	Borrichia frutescens
	Wax Myrtle	Myrica cerifera
Herbs:	Salt Grass	Distichlis spicata
	Black Needlerush	Juncus roemerianus
	Glasswort	Salicornia virginica
	Salt Marsh Cord Grass	Spartina alterniflora
	Salt Meadow Hay	Spartina patens
	Arrow Grass	Triglochin striata

Ecological Significance:

In regards to remnant, endangered or threatened species, the North River marshes are notable as a marsh area regularly attracting shorebirds that are generally uncommon or rare in intertidal areas (i.e. White-rumped sandpipers, Black-necked stilts, Stilt sandpipers, Long-billed dowitchers, Pectoral sandpipers, Common snipes and Lesser yellowlegs). Elsewhere in the county, the first five species are primarily restricted to manmade sites such as shallow pools on spoiling sites. From mid-April to mid-May, shorebirds are most common and there are often hundreds of birds. The marshes also harbor many herons, egrets and ibises. In the late summer numbers of these waders are impressive. Glossy ibises, which are common, are a species that is generally rare in intertidal areas in this county. Many of the Glossy Ibises that nest at Phillips Island near Morehead city probably feed at these marshes. In fall, winter, and spring, there are u sually a few ducks in the marsh. Mallards and Black ducks nest here. Black rail s, occur in the marsh and may nest here. The marshes also occasionally attract some notable rarities (i.e. Roseate spoonbill, Peregrine falcon, Merlin, American Golden Plover, and Wilson' s Phal arope).

Management Recommendations:

I would rate the North River marshes at least of statewide significance because of its size, relatively undisturbed state, the variety of microhabitats within the marsh, and its economic significance.

Salt marshes are classified as areas of environmental concern, so the North River marshes are included in this classification. Threats to the area do not really include immediate development, so it probably is not necessary to purchase the area. However, a conservation easement would be justified.

Filling and ditching represent more immediate threats to the area. If ditching is needed for the adjacent land areas and for mosquito control, the existing ditches should be used.

Grazing is probably not particularly harmful, although it may have some negative effect on some of the ground-nesting birds. It appears to be beneficial to shorebirds in that feeding habitat is improved.

The best management scheme for the North River marshes is to leave them essentially the way they are now.

Addenda to the North River report:

Soil Information:

All of the soil in the North River marshes is an Axis muck. This soil is regularly flooded with a high salt content. It is not suitable to develop or for agriculture. Species typical of this soil type are Juncus roemerianus, Spartina alterniflora, S. patens, S. cynosuroides, and Salicornia virginica .

Reference:

Soil Conservation Service, U.S. Dept. of Agriculture. 1979. Soil Survey Interim Report. Carteret County, North Carolina. (advance copy, subject to change.)

Pringle Road Carolina Bays

Name of Area: Pringle Road Carolina Bays

Location: In southern Croatan National Forest. Carolina Bay A: The NW tip of the prominent rim of this bay is ca. 400 yards SE of Millis Road. Its SW rim is ca. 150 yards NE of Pringle Road. Carolina Bay B: Lies immediately NE of and is parallel to Bay A. See Map 25 .

Quad: Intersection of Salter Path, Swansboro and Maysville

Date: 10 October 1980

Investigator: John Fussell

Physical/Habitat Feature: Carolina Bays

Survey Priority: Medium: These two Carolina Bays have the following positive attributes: 1) they are prominent, well-defined, and large (for the county), 2) they are within the National Forest so some degree of protection is feasible, 3) they have a rather wide range of habitats (for Carolina Bays in Carteret County), 4) they are located within a complex of "natural areas", the pocosin to the north being designated as wilderness, the Patsy Pond natural area to the SE, and the Millis Road savannah to the NE.

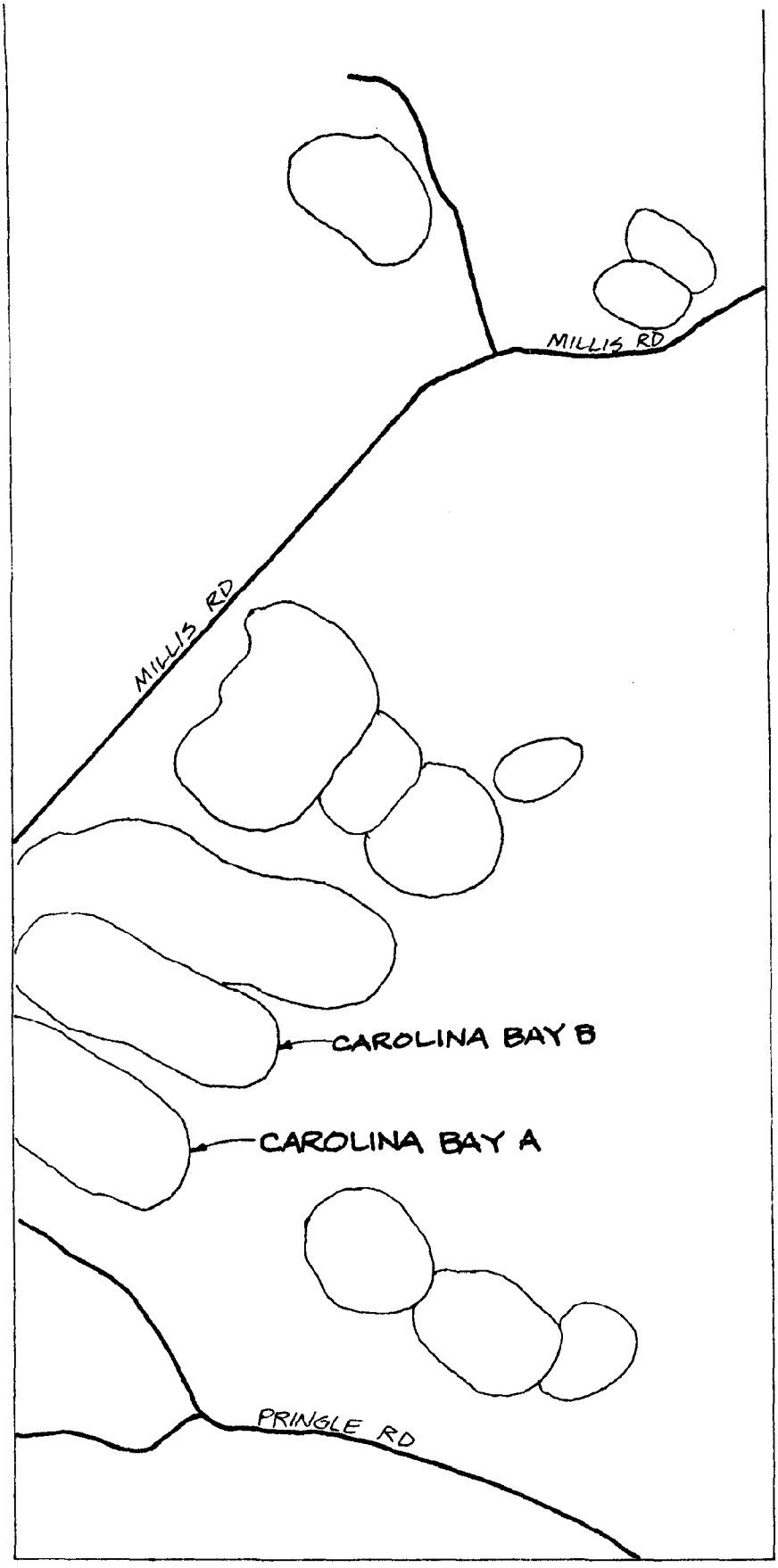
Dominant Vegetation: Carolina Bay A; Vegetation of ca. 90% of bay (total acreage ca. 40) is similar to most pocosin and Carolina bay vegetation in Carteret County, i.e. scattered Pinus serotina to ca. 40' with a dense broadleaf evergreen shrub growth (up to 10') dominated by Cyrilla racemiflora, Lyonia lucida, Ilex coriacea, Smilax laurifolia, etc. However, this bay has a small area (ca. two acres) dominated by Nyssa sylvatica var. biflora (ca. 40' high), near the southeast end of the bay, and a Cladium jamaicense marsh (ca. one acre) at the southeast corner of the bay The last two situations are rare in Carolina Bays in this county.

Carolina Bay B; Like Bay A, this ca. 40 acre bay is dominated by Pinus serotina (some to 50') and a low thick growth of broadleaf evergreen shrubs (ca. 37 acres). It also contains ca. three acres dominated by Nyssa sylvatica var. biflora (40+').

Site Quality: Both the Pinus serotina and Nyssa sylvatica trees are generally small; their age is unknown. The general quality (and "potential") of both bays is enhanced by their proximity to each other and their proximity to the large pocosin (proposed as wilderness) which begins about one mile NW, the Millis Road longleaf pine savannah (2 miles NE), and to the Patsy Pond natural area (2 miles SE).

Elevation: Ca. 35-38'. The rim around the Carolina Bay is about three feet higher than the bay center.

Soil Series: Not yet mapped in Carteret County Soil Survey, but is probably Murville Sand (Jeannie Wilson).



ROUGH SKETCH TAKEN FROM USDA-ASCS AERIAL PHOTO, 1971.

SITE IS AT INTERSECTION OF SALTER PATH, SWANSBORO AND MAYSVILLE QUADRANGLES.

MAP 25: PRINGLE ROAD CAROLINA BAYS

SIZE: Each bay is ca. 40 acres in extent.

GEOLOGICAL FORMATION: Flanner Beach Formation, Pleistocene. This pair of Carolina Bays lies with a pair of larger less distinct Carolina Bays. All these bays lie along the NW side of a well-defined series of relict beach ridges of Pleistocene age, the "Newport Barrier". Mixon,R.B. & O.H. Pilkey, 1976. Reconnaissance Geology of the Submerged and Emerged Coastal Plain Province, Cape Lookout Area, U.S. Geol. Survey Prof. Paper 859. US Govt. Print. Off.

DRAINAGE: Probably no surface drainage from bays. Subsurface drainage probably into Bogue Sound via Gales and Broad Creek.

ENDANGERED AND THREATENED SPECIES PRESENT: There are a few Venus Flytraps (Dionaea muscipula) along the slope of the rim around Carolina Bay A.

POTENTIAL FOR ENDANGERED & THREATENED SPECIES: Red-cockaded woodpeckers sometimes nest in pond pines in pocosin and Carolina Bays, especially after fire. Although no rare species were seen, the marsh and marsh edge at the southeast end of Carolina Bay A is a situation where rare species might be expected. In the future, Carolina Bays themselves may be considered threatened entities. Fussell found a dead eastern diamondback rattlesnake (Endangered) on Millis Road, 1-2 miles from here in May 1973, so that species may occur here.

SITE INTEGRITY: There is no evidence of recent disturbance in the bays themselves. Mature longleaf pine timber on the bay rims was clearcut ten or more years ago, and loblolly pines have been replanted there.

OWNER: USDA, Forest Service, Croatan National Forest.

OTHER KNOWLEDEABLE PERSONS: Michael Alford, Jeannie Wilson, Hampton Mariners Museum, Beaufort, N.C. 28516.

COMMENTS: Although Carolina bays are not now rare in Carteret County, they are being increasingly destroyed and altered by human activities, and relatively unaltered examples will probably be rare in a few years.

* PLANTS OBSERVED

Trees:	Acer rubrum, Magnolia virginiana, Nyssa sylvatica var. biflora, Pinus serotina.
Shrubs:	Clethra alnifolia, Ilex cassine var. myrtifolia, Ilex coriacea, Lyonia lucida, Myrica cerifera, Myrica heterophylla, Sorbus arbutifolia.
Vines:	Smilax laurifolia, Smilax rotundifolia
Herbs:	Centella asiatica, Eriocaulon decangulare, Lobelia glandulosa, Pluchea foetida, Proserpinaca pectinata, Sabatia difformis, Sarracenia flava, Typha latifolia.
Graminoids:	Andropogon virginicus, Cladium jamaicense.
Ferns:	Osmunda cinnamomea.
Moss:	Sphagnum sp.

* A species list was made only for the marsh area in Bay A.

Sea Gate Woods

Natural Area Name: Sea Gate Woods

Location: This hardwood forest is bordered on the south by Sea Gate development, on the east by an abandoned pecan orchard along the west side of the intracoastal waterway; on the north by (approx.) the Craven Co. line, and on the west by pocosin. See Map 26

Topographic Quadrangle: Core Creek

Size: ca. 300 acres (roughly 1 mile x ½ mile)

Elevation: 8-13'

Access: Easily accessible from the road that runs along the intracoastal waterway.

Names of investigators: John O. Fussell, III and Jeannie Wilson

Date(s) of Investigation: November 2 & 12, 1980
Also, Fussell has visited this area several times in December and late April-mid May, 1972-1980, in search of birds.

Number of Owners: two

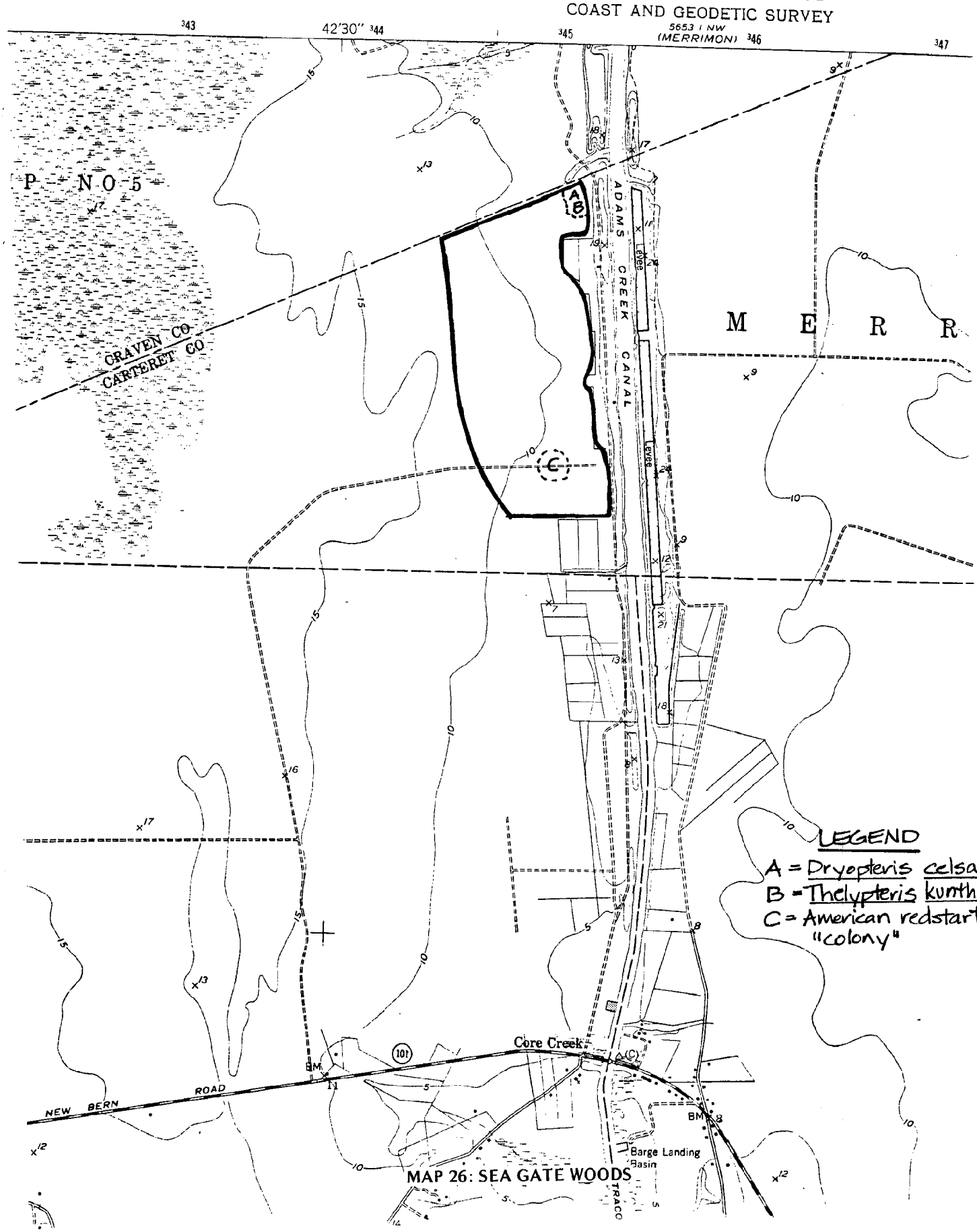
Names of Owners: International Paper Co. and Moulton

Use of Natural Area: Hunting (primarily deer)

Use of Surrounding Land: Wildland - 50%; Agricultural land - 40%; Developed land - 10%.

Management Problem Description: Introduction of drainage canals on adjacent International Paper Co. land presents a threat to integrity.

Threats: We assume the 244 acres owned by an individual is not threatened directly in the forseeable future. However, ca. 50 acres owned by International Paper Co. is adjacent to what appears to be the beginnings of clearcutting/tree farm operations, and it might be clearcut also. Drainage canals are being installed and these could alter areas that are not cut.



MAP 26: SEA GATE WOODS

DESCRIPTION OF SITE

This hardwood tract covers ca. 300 acres, and is roughly rectangular, ca. one mile x ½ mile, the long axis north-south. The forest has many species characteristic of floodplains and similarly "wet" areas in this county, but the area is not a floodplain and it never or rarely has standing water. This usually "fairly moist but rarely wet" situation is probably largely due to the fact that the area sits on a broad slight elevational decline. The western edge of the area has an elevation of ca. 13'; at the eastern edge, the elevation is ca. 8'. The major excavation of the intracoastal waterway only 200 yards from the eastern edge of the area probably also contributes to the moisture situation. However, it should be noted that many of the canopy trees in the tract outdate the waterway.

Species composition varies with the tract, but, in general, Liquidambar styraciflua is the major tree. At some points, it is dominant; at others, it is co-dominant with Quercus michauxii and Fraxinus sp. (tomentosa?). In one small area along the west edge of the tract, ca. 30% of the canopy trees are notably large Pinus taeda-- 100' high with a DBH of 2'. In another limited area, there are several Fagus grandifolia, but these are mostly small-- DBH less than 18".

Average DBH of all canopy trees is ca. 20', but at some points, it is 24". Largest trees seen were Liriodendron tulipifera, DBH -4'; Quercus laurifolia, DBH- 3.5'. Canopy height is mostly 80', but is locally 100'.

Over most of the area, the understory is similar. It is fairly open and is comprised primarily of Carpinus caroliniana and Ilex opaca. The shrub layer vegetation is more variable. Over most of the area, there is generally no shrub stratum, except for patches of Leucothoe axillaris. Toward the north and east, Sabal minor often forms a definite shrub layer. At one point, the palmettos are impressive, with fronds over 6', the largest we have seen in the county.

Ground cover also varies from southwest to northeast. Over most of the area, the cover is sparse, patches of Woodwardia areolata and other species alternating with nearly bare ground. To the northeast, Polystichum acrostichoides often forms moderate cover.

Woody vines are common but do not provide significant cover; Decumaria barbara is probably most common. Tillandsia usneoides was not noted. If present, it is sparse.

At the northeast corner of the tract, there is a small area that deserves special mention. Here, at the edge of the forest, where the edge of spoil material from the waterway is present, there is an abundance of ferns, primarily Thelypteris kunthii and Dryopteris celsa. We do not know of either of these species being found in the county before. The soil pH here is at least 6.5 (probably locally higher), compared to 6.0 to the west away from the spoil material. The Thelypteris is certainly present because of this situation; the Dryopteris may be.

Significance Summary

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
High quality natural area		Hardwood forest (primarily Liquidambar)	In terms of size and maturity, this is the most impressive
			tract of "bottomland" hardwoods in the county, and notable
			because it is not associated with a floodplain. This tract
			supports at least 1 threatened plant species, 3 threatened bird
			species and 3 special concern bird species.
Threatened peripheral species	a.	Dryopteris celsa- see text	This may be the only population in the county.
Threatened species		Turkey vulture	Resident- may breed in area.
Threatened species		Black vulture	Resident- may breed in area.
Threatened species		Red-shouldered hawk	Resident- probably breeds in area.
Species of special concern		Black-throated green warbler/occurs primarily along west border of tract.	Area has one of highest populations in county
Species of special concern		Swainson's warbler	
Species of special concern		Prothonotary warbler	
Species of special concern		Black bear probably occurs in this tract at least occasionally.	

Significance Summary

a. Feature	Map Legend	b. Description of significant feature	c. Comparative assessment
Rare species-no specific category	b.	Thelypteris kunthii	This species is known from 2 locations in the state, the other area, Carolina Beach. This is apparently the northernmost locality at which this species has been found.
Locally rare species	c.	American redstart	Breeding population of 5-10 pairs. Species is very rare in outer coastal plain of N.C. This is one of three "colonies" in Carteret County.

MANAGEMENT AND PRESERVATION RECOMMENDATION

For this tract to maintain its biological value, it should be preserved in its present state. Preservation by itself would probably be adequate; little future management would probably be needed for this hardwood tract.

At this time, there are two potential threats to the area; 1) logging. This would almost certainly be clear-cutting, especially on the International Paper Co. land. 2) introduction of drainage canals on adjacent land. The firest threat, clear-cutting, would be totally incompatible with the values of the tract, of course, since the present habitat would be destroyed and most or all of the rare species would be forced from the area. The introduction of drainage canals is difficult to evaluate, but could lower the water table appreciably.

The major owner of the tract was not contacted and his feelings regarding preservation are unknown to us. International Paper Co. might consider, for the sake of public image, granting a conservation easement on their small portion of the tract, especially if the presence of some rarer species were stressed. Their attitude might be altered by plans and attitudes of the major owner.

RATING: Medium+ priority

STATEMENT OF SITE SIGNIFICANCE

This forest, because of its size and the relative maturity of the trees, is the most impressive area of hardwoods in this county. It is also notable because it is not a floodplain or swamp forest; most of the larger hardwood areas in this county are limited to those situations. In part of the forest, Sabal minor is a major structural component (shrub level), to a degree we have not seen elsewhere in this county. Also, an "inland species" that is generally uncommon in this county, Polystichum acrostichoides, provides dominant ground cover on part of the tract,

This forest provides habitat for several rare bird species. Turkey vulture, black vulture, and red-shouldered hawk, all threatened, are resident here. The red-shouldered hawk almost certainly breeds within the tract; the others may do so also. Three species of special concern are breeding residents here; black-throated green warbler, Swainson's warbler, and prothonotary warbler. The black-throated green warbler is most notable; this area may have the second highest breeding population in the county. Of undetermined status, the worm-eating warbler breeds along the edges of the tract. Near the south end of the tract, there is a breeding population of 5-10 paris of American redstarts. This species is rare as a breeding bird in the outer coastal plain of North Carolina; this breeding population is one of only three in Carteret County.

Although not natural, a site at the edge of the area harboring a large population of two rare fern species adds to the biological richness of the tract. The site is at the northeast edge of the tract, at the border of the forest and old spoil material from the inland waterway. Shell material from the spoils has increased the soil pH, and this appears to be why there are large numbers of Thelypteris kunthii and Dryopteris celsa. This appears to be the second record of the Thelypteris for the state and the northernmost site at which the species has been found. This is apparently also the first record of the Dryopteris in the county; this species is considered to be threatened in North Carolina.

Natural Characteristics Summary

a. Vegetation-Biotic Community Summary

Community type: Most common is Liquidambar styraciflua or Mixed hardwoods/ Carpinus caroliniana-Ilex opaca. Notable variation is Mixed hardwoods/Carpinus caroliniana-Ilex opaca/Sabal minor/Polystichum acrostichoides.

Community cover type: Liquidambar styraciflua or Mixed hardwoods

General habitat feature: Hardwood forest

Average tree height: 80+'

Estimated age of canopy trees: up to 100

Estimated size of association (sq. meters, acres, etc.): ca. 300 acres.

Successional stage:

Sere type: near climax

Common canopy species in community cover type or community type (but not dominant): Liriodendron tulipifera, Fraxinus sp. & Quercus michauxii-locally co-dominant;Quercus nigra & Q. laurifolia common.

Common subcanopy-shrub stratum species in community cover type or community type (but not dominant): Acer rubrum, Cornus florida, Symplocos tinctoria, Lyonia lucida, Ligustrum sinense.

Common herb stratum species in community type (but not dominant): Woodwardia areolata, Asplenium platyneuron, Boehmeria cylindrica, Carex spp, Saururus cernuus, Mitchella repens

Successional stage:

Sere type:

b. Soil Summary

Source of information: SCS, USDA. 1979. Soil Survey of Carteret County, N.C., Interim report.

Soil series: Deloss fine sandy loam, Roanoke loam, Newhan-Carteret (spoil)

Soil order: Deloss and Roanoke- Ultisol, Newhan-Carteret- Entisol

* pH class: Deloss- 4.5-6.5 strongly acidic to acidic, Roanoke-4.5-5.5, strongly acidic to acidic, Newhan-6.6-7.8, acidic to circumneutral.

Moisture class: Deloss-wet, floods, Roanike, clayey, floods, Newhan, droughty

Associated community cover type or community type:

* pH tested was 6.0; near Thelypteris and spoil material 6.5

c. Hydrology Summary

Drainage basin: Neuse and Newport Rivers

Hydrologic system: terrestrial

Hydrologic subsystem: mesic

Water chemistry: fresh

Water regime: intermittently exposed

d. **Summary-Topography and Physiography**

Topographic site type characteristics:

Land form: portion of a very slightly sloping plain

Shelter: sheltered

Aspect: N.A.

Slope angle: nearly level 0-2°

Profile: N.A.

Surface patterns: mostly smooth

Position: N.A.

Physiographic site type of natural area: "Sea Gate Woods"

Physiographic site type of community cover type or community type: all of Sea Gate Woods.

Geologic formation: Core Creek Sand
Geologic formation age: Pleistocene

References: Mixon,R.B. & OH PIlkey. 1976. Reconnaissance Geology of the Submerged and Emerged Coastal Plain Province, Cape Lookout Area, N.C. US Geol Survey Prof. Paper 859. US Govt. Print. Off.

e. Summary - Endangered and threatened species

Name of species: Dryopteris celsa

Species legal status: Threatened peripheral

Number of populations on site: one seen

Number of individuals per population: at least "scores"

Size or maturity of individuals: were fertile

General vigor of population: apparently good

Disturbance or threats to population: none known

Habitat characterists

Vegetation association:
Topography:
Soil series:
Microclimate:
Drainage basin:

Plants on logs; soil more basic than surrounding areas (pH 6.5 compared to 6.0) because of shell material from spoils from the inland waterway.

Other plants and animals species present:

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

f. Master species lists

e. Summary - Endangered and threatened species

Name of species: Thelypteris kunthii

Species legal status: Not listed in Cooper et al, 1975, because species had not been found in state at that time.

Number of populations on site: one

Number of individuals per population: hundreds

Size or maturity of individuals: fertile

General vigor of population: good

Disturbance or threats to population: none known

Habitat characterists

Vegetation association:
Topography:
Soil series:
Microclimate:
Drainage basin:
Other plants and animals species present:

Soil more basic than surrounding area (6.5 compared to 6.0) because of shell material from spoils from the inland waterway.

AERIAL OR DETAILED MAPS WITH POPULATIONS CLEARLY MARKED.

f. Master species lists

SPECIES LISTS

PLANTS

Trees:	Acer rubrum	Morus rubra
	Carpinus caroliniana	Myrica cerifera
	Cornus florida	Nyssa sylvatica var. biflora
	Fagus grandifolia	Persea borbonia
	Fraxinus sp. (tomentosa?)	Pinus taeda
	Ilex opaca	Quercus laurifolia
	Liquidambar styraciflua	Quercus michauxii
	Liriodendron tulipifera	Quercus nigra
	Magnolia virginiana	Ulmus americana
Shrubs:	Callicarpa americana	Myrica heterophylla
	Leucothoe axillaris	Sabal minor
	Ligustrum sinense	Symplocos tinctoria
	Lyonia lucida	
Herbs:	Boehmeria cylindrica	Sanicula canadensis
	Geum canadense	Saururus cernuus
	Impatiens capensis	Tipularia discolor
	Mitchella repens	
Vines:	Ampelopsis arborea	Rhus radicans
	Anisostichus capreolata	Smilax bona-nox
	Decumaria barbara	Smilax laurifolia
	Lonicera japonica	Smilax smallii
	Matelea suberosa	Vitis rotundifolia
	Parthenocissus quinquefolia	
Epiphytes:	Phoradendron serotinum	
Graminoids:		
	Arundinaria gigantea	Cyperus spp.
	Carex spp.	Panicum spp.
Ferns:	Asplenium platyneuron	Polystichum acrostichoides
	Athyrium asplenioides	Thelypteris kunthii
	Botrychium dissectum	Thelypteris palustris
	Dryopteris celsa	Woodwardia areolata
	Osmunda cinnamomea	Woodwardia virginica
	Osmunda regalis	

ANIMALS

Amphibians:		Southern leopard frog
Reptiles:	Eastern mud turtle	Black racer
	Eastern box turtle	Rat snake
	Carolina anole	Rough green snake
	Ground skink	Copperhead
	Eastern glass lizard	

Birds:

- Great blue heron
- Turkey vulture
- Black vulture
- Sharp-shinned hawk
- Red-shouldered hawk
- Yellow-billed cuckoo
- Screech owl
- Great horned owl
- Barred owl
- Chuck-will's-widow
- Ruby-throated hummingbird
- Common flicker
- Pileated woodpecker
- Red-bellied woodpecker
- Yellow-bellied sapsucker
- Hairy woodpecker
- Downy woodpecker
- Great crested flycatcher
- Eastern phoebe
- Acadian flycatcher
- Blue jay
- Common crow
- Fish crow
- Carolina chickadee
- Tufted titmouse
- Red-breasted nuthatch
- Brown-headed nuthatch
- Brown creeper
- Winter wren
- Carolina wren
- Gray catbird
- Brown thrasher
- American robin
- Wood thrush
- Hermit thrush
- Blue-gray gnatcatcher
- Golden-crowned kinglet
- Ruby-crowned kinglet
- Cedar waxwing
- White-eyed vireo
- Solitary vireo
- Red-eyed vireo
- Black-and-white warbler
- Prothonotary warbler
- Swainson's warbler
- Worm-eating warbler
- Northern parula
- Black-throated blue warbler
- Yellow-rumped warbler
- Black-throated green warbler
- Pine warbler
- Ovenbird
- Kentucky warbler
- Common yellowthroat
- Hooded warbler
- American redstart
- Red winged blackbird
- Rusty blackbird
- Common grackle
- Brown-headed cowbird
- Summer tanager
- Cardinal
- Indigo bunting
- Evening grosbeak
- Purple finch
- Pine siskin
- American goldfinch
- Rufous-seded towhee
- Dark-eyed junco
- White-throated sparrow
- Fox sparrow
- Swamp sparrow
- Song sparrow

Mammals:

- Opossum
- Eastern mole
- Raccoon
- Eastern gray squirrel
- Whitetail deer

Reference cited: Cooper J. et al (Eds). 1977. Endangered and Threatened Plants and Animals of North Carolina. N.C. State Museum of Natural History, Raleigh, N.C.

Union Point Pocosin

Name of Area: Union Point Pocosin

County: Carteret and Craven

Location: Pocosin centered ca. 2 miles N of Union Point community, which is ca. 1.5 miles NE of Newport, N.C. See Map 27.

Quadrangle: Newport

Date: November 3, 1980

Investigator: John Fussell (Report by Fussell and Jeannie Wilson)

Physical/Habitat Feature: pocosin

Survey Priority: medium - due primarily to it being a large extent of "wild land". This is the second largest contiguous tract of pocosin in the county, 6000+ acres.

Dominant Vegetation: See comments.

Site Quality: Age of Pond Pine is unknown; however, there is no evidence of recent fire. Total pocosin acreage, 6000+, is large.

Elevation: ca. 24'

Topography: Essentially flat, featureless, edges dissected by small streams.

Soil Series: Information unavailable from incomplete soil survey of Carteret County.

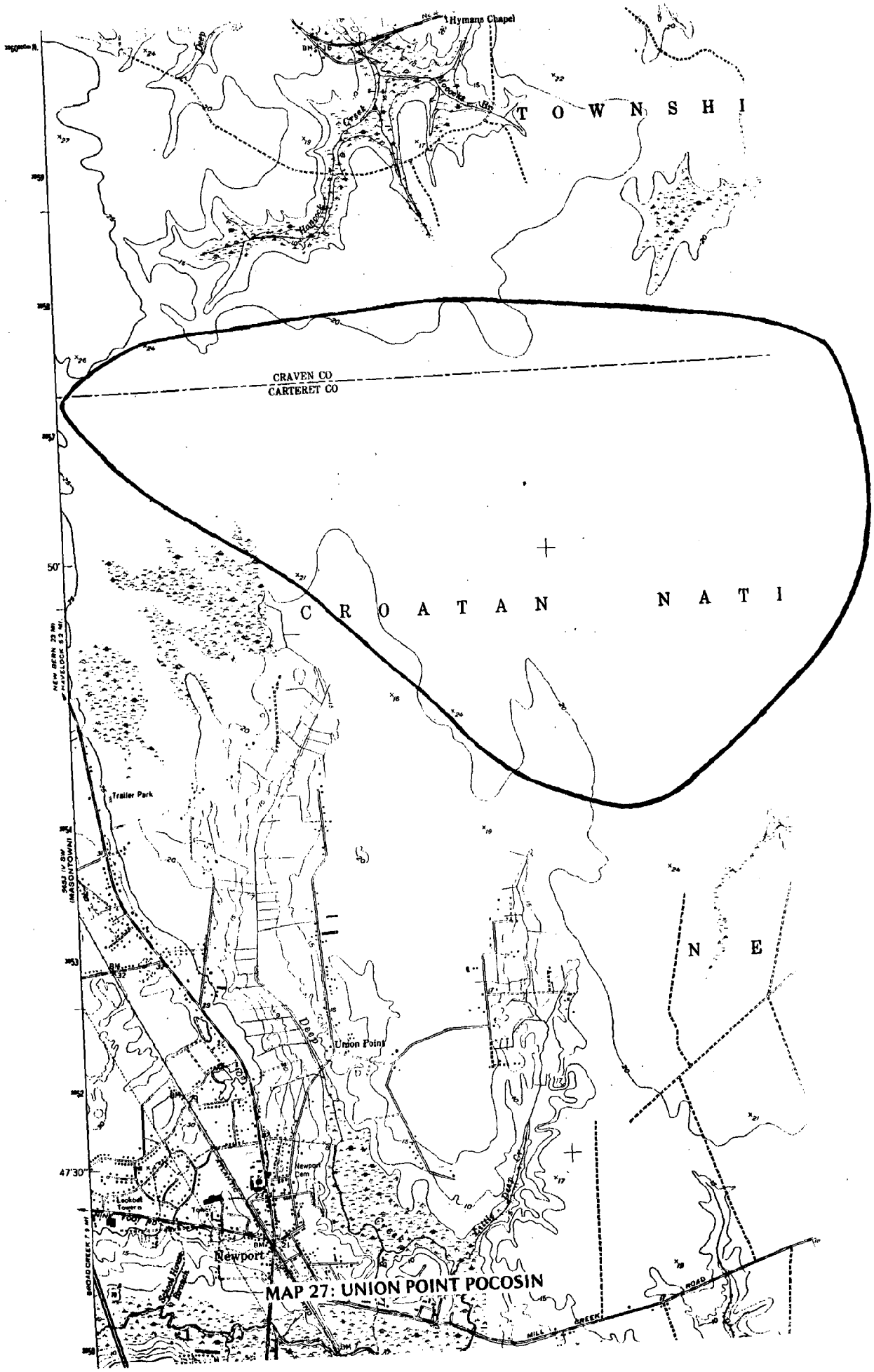
Size: All pocosin - 6000+ acres

Geological Formation: Flanner Beach Formation, Pleistocene
Mixon & Pilkey, 1976. Reconnaissance Geology of the Submerged and Emerged Coastal Plain Province, Cape Lookout Area, N.C. US Geol. Surv. Prof. Paper 859. US Govt. Printing Off.

Drainage: N to Neuse River, S to Newport River

E & T Species Present: none known

Potential for E & T Species: Some of area is marginal habitat for Red-cockaded woodpeckers. Black bears, now considered of special concern status, but which may be considered threatened in the future, occur here.



MAP 27: UNION POINT POCOSIN

Site Integrity: There are no significant human encroachments within this tract.

Owners: USDA, Forest Service, Croatan National Forest.

Other Knowledgeable Persons: Dr. Gene Huntsman, NOAA, National Marine Fisheries, Beaufort, N.C. 28516

Other Comments: This is the second largest contiguous tract of pocosin left in Carteret County. The area of Pinus serotina/Arundinaria gigantea may be the largest in this county, but this would be difficult to ascertain.

DOMINANT VEGETATION: Most of the area is high pocosin dominated by Pinus serotina, Gordonia lasianthus, Cyrilla racemiflora, Lyonia lucida, Ilex coriacea, etc. The purpose of this trip was to visit two areas which apparently (based on aerial photographs) had relatively low vegetation. The first (ca. 2000' X 1500') lies ca. one mile NW of the Main Prong; the second (ca. 4000' X 3000') lies one mile NW of the first. On this visit, only the SE site could be reached; the second site is probably similar to the first site. Characterization of the vegetation at the SE site is: Pinus serotina (sparse)/Lyonia lucida-Cyrilla racemiflora/Sphagnum sp//Smilax laurifolia. The pines are ca. 15-20', the largest have a DBH of 14". The mass of Lyonia and Cyrilla is ca. 4' high.

One quarter mile NW of the area described above, an area of Pinus serotina/Arundinaria gigantea was found. The pines averaged 25' with an 8" DBH; the cane was 8'. This community cannot be safely differentialed on aerial photographs. It appears to have an extent of ca. 2000' X 400'; we do not know of any similarly-sized tracts of Pinus serotina/Arundinaria gigantea in the county. The pocosin grades into bay forests at some points and borders sylvicultural lands elsewhere.

PLANTS OBSERVED (List is restricted to immediate sites mentioned above):

Trees: Acer rubrum (none tree size), Cordonia lasianthus, Magnolia virginiana (none tree size), Nyssa sylvatica var. biflora (none tree size), Persea borbonia, Pinus serotina.

Shrubs: Cyrilla racemiflora, Ilex glabra, Kalmia angustifolia var. caroliniana, Lyonia lucida, Myrica heterophylla, Sorbus arbutifolia, Vaccinium atrococcum, Zenobia pulverulenta.

Vines: Smilax laurifolia

Herbs: Xyris sp.

Graminoids: Arundinaria gigantea, Carex walteriana, Eriophorum virginicum.

Ferns: Woodwardia virginica

Moss: Sphagnum sp.

ANIMALS OBSERVED

Birds: Turkey vulture, Black vulture, Carolina chickadee, House wren, Winter wren, Carolina wren, Ruby-crowned kinglet, Yellow-rumped warbler, Rufous-sided towhee.

Mammals: Whitetail deer (Black bears occur also)

Walker's Mill Pond

Natural Area Name: Walker's Mill Pond

Location: Tract includes Walker's Mill Pond and associated swamp forests and floodplains. This area is ca. 3 miles E of the Town of Newport. See Map 1.

Topographic Quadrangle: Newport

Size: Ca. 500 acres

Elevation: 3-20'

Access: SR 1154 passes through area. Logging roads provide access to other parts of area.

Names of Investigators: John O. Fussell, III and Jeannie Wilson

Date(s) of Investigation: 1980: July 5; Sept. 13, 16, 23; Nov. 3 (Also, Fussell has made many trips to this area, 1965-1980, mostly winter and spring, primarily in search of birds. He made systematic censuses of breeding birds in part of the area in 1970.)

Protection Status: The pond and swamp forest is apparently being preserved by a hunting and fishing club.

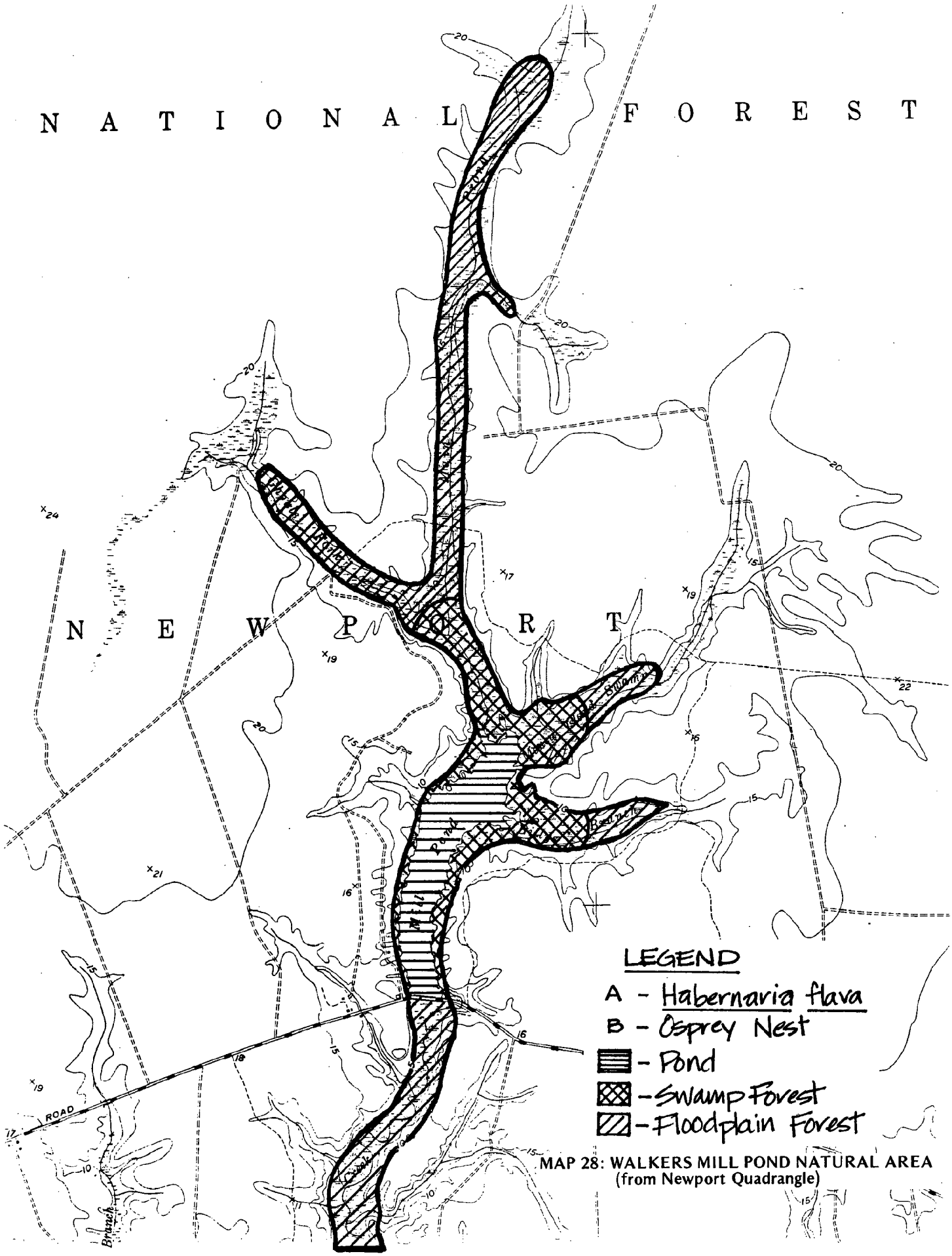
Table 11
Walker's Mill Pond

Significance Summary:

Feature	Map Legend	Description of Significant Feature	Comparative Assessment
Special habitat		The major significance of this area is that it includes a complex of habitats that support many rare species.	
High quality plant community		Fraxinus sp.-Nyssa sylvatica var. biflora-Taxodium distichum/ Acer rubrum	The floodplain areas are slightly significant at a county level, because collectively, they make up a substantial acreage. The Main Prong floodplain is most significant in terms of area and tree size.
High quality plant community		Mesic mixed hardwoods. Mostly Carya glabra - Quercus nigra/Cornus florida/ Polystichum acrostichoides and C.glabra-Q. michauxii/Cornus florida/Lyonia lucida	Hardwood forests on mesic sites are rare in Carteret County. Major negative point regarding these hardwood forests are their very limited size, especially narrowness. However, they are important to the presence of several rare species on the tract
Endangered species		American alligator	
Threatened species	a.	Habernaria flava: Floodplain forests	
Threatened species		Anhinga	Possibly breeds and may be only breeding population in county.
Special concern		Turkey vulture	
Special concern		Black vulture	
Special concern		Cooper's hawk	
Special concern		Red-shouldered hawk	Population is notably high.

Table 11 (cont'd)

Feature	Map Legend	Description of Significant Feature	Comparative Assessment
Species of special concern	b = nest	Osprey	At least one pair has bred here 10+ years.
Species of special concern		Great blue heron	A few birds apparently nest, probably in floodplain areas.
Species of special concern		Red-tailed hawk	
Species of special concern		Black-throated green warbler	Uncommon. Apparently limited to north Main Prong.
Species of special concern		Swainson's warbler	Several pairs present throughout area.
Species of special concern		Prothonotary warbler	
Species of special concern		Black bear	
Undetermined status species		Worm-eating warbler	
Undetermined status species		Black-and-white warbler	
Locally rare species		Ovenbird	
Locally rare species		Kentucky warbler	



MAP 28: WALKERS MILL POND NATURAL AREA
(from Newport Quadrangle)

DESCRIPTION OF SITE (See map 28.)

Pond

The focal point of this natural area is Walker's Mill Pond (now usually called "The Mill Pond"). This reservoir was reportedly constructed shortly after 1900; it occupies a former floodplain and is long and narrow, running generally N-S. The extent of open water is about 125 acres; the pond is probably mostly less than 5' in depth. The pond itself is relatively "sterile"; its associated swamp forests and floodplain forests are much more biologically productive.

Swamp forest

At the mouths of the four streams running into the pond, where the water is ca. 1-4 feet deep, there are swamp forests made up almost exclusively of Taxodium distichum; these trees have a thick covering of Tillandsia usneoides. Trees are about 70' high with an average DBH of ca. 20". The water is mostly covered with Nymphaea odorata. This is the most impressive example of this type community in Carteret County; of course it is artificial though. Common here are yellowbelly sliders and cottonmouths. Wood ducks are common in winter and prothonotary warblers and northern parulas in summer.

Floodplain forest

Flowing into the mill pond are four floodplains, and another one drains the pond into the Newport River. Together these make up ca. 250 acres of floodplain forest in rather close proximity. The major stream and floodplain, the Main Prong, is most notable because of its extent, especially width (500+ feet across). Major canopy trees are Fraxinus sp. (tomentosa?), Nyssa sylvatica var. biflora, and Liquidambar styraciflua; Nyssa is most common downstream and Liquidambar is most common upstream.

At the Main Prong, where the vegetation was analyzed, the canopy height is 80' and the average DBH is ca. 20". The understory is dominated by Acer rubrum. The shrub layer is generally sparse. The most frequent species are Saururus cernuus and a species of Carex.

Cottonmouths are also common in these areas. Common permanent residents are downy woodpeckers, Carolina chickadees and tufted titmice; in summer, red-eyed vireos, prothonotary warblers, and northern parulas are common

Mesic hardwood forest

Between the floodplain forests and the surrounding sylvicultural lands, there is often a narrow strip of mesic forest. This varies in width from nothing to ca. 200'. This community is limited to the slight (ca. 5') and narrow slope that usually borders the floodplains and to a narrow strip of upland along the slopes. This community type is rare in the county and its presence within the natural area contributes to the presence of several rare species.

Species composition appears to vary considerably. Where analyzed next to the Main Prong, co-dominants are Carya glabra and Quercus nigra at one site and Carya glabra and Quercus michauxii at another. The average DBH is 22' and the canopy height is 80'. The understory is dominated by Cornus florida. At the first site, there is thick ground cover dominated by Polystichum acrostichoides; at the secon site, there is a thick shrub cover dominated by Lyonia lucida. At another site, also along the Main Prong, there is the notable situation of a mixture of mature hardwoods and 80 year old longleaf and loblolly pines, apparently the result of selective cutting about 1900.

Rare species in the natural area that are largely limited to this community are black-and-white warbler, ovenbird, and Kentucky warbler. Often, along the slope, there is an ecotonal area characterized by a thick growth of Sabal minor, Lyonia lucida, Leucothoe axillaris, and several ferns. This is excellent habitat for Swainson's warblers.

Management and preservation recommendation:

We can think of no management that is needed for the area at this time. This area is, fortunately, probably not threatened for at least 20 years (the approximate time of the first "harvest" of adjacent sylvicultural lands). The pond and the swamp forests are protected as part of a hunting and fishing preserve. The floodplain forests and mesic hardwood forest areas are probably not threatened until the next harvest of adjacent sylvicultural lands, probably about 2000. Major threat then might be that the paper companies will be even more efficient in removing the mesic hardwood strip for conversion to sylviculture.

Rating Medium+ priority

Statement of site significance

The major significance of this "natural area", which is actually to a large extent a man-made natural area, is that it includes a complex of habitats that support many rare species. We know of at least 17: endangered-- American alligator; threatened-- Habernaria flava, anhinga, turkey vulture, black vulture, red-shouldered hawk; of special concern-- great blue heron, red-tailed hawk, osprey, black-throated green warbler, Swainson's warbler, prothonotary warbler, black bear; undetermined-- worm-eating warbler, black-and-white warbler; locally rare-- ovenbird, Kentucky warbler.

The baldcypress swamp forest is, although not natural, the best example of this type community in the county.

The floodplain forests are slightly significant for natural values, making up one of the better examples of this community in the county. The mesic hardwood area is also slightly significant. This is a rare community in this county. The major negative feature of this mesic hardwood forest is its limited (especially narrow) size.

A. Natural Characteristics Summary

a. Vegetation-Biotic Community Summary

Community type: Taxodium distichum/Nymphaea odorata//Tillandsia usneoides

Community cover type: Taxodium distichum

General habitat feature: Swamp forest

Average tree height: 80'

Estimated age of canopy trees: 100?

Estimated size of association (sq. meters, acres, etc.): 100 acres

Successional stage:

Sere type: Trees probably predate pond.

Common canopy species in community cover type or community type (but not dominant): NA

Common subcanopy-shrub stratum species in community cover type or community type (but not dominant): NA

Common herb stratum species in community type (but not dominant): NA

Successional stage:

Sere type:

b. Hydrology Summary

Drainage basin: Newport River

Hydrologic system: Palustrine

Hydrologic subsystem: Aqueous

Water chemistry: Fresh, acidic (pH unknown)

Water regime: Permanently (artificially) flooded

c. Summary-Topography and Physiography

Topographic site type characteristics:

Land form: Submerged floodplain

Shelter: Some sections are relatively exposed to southerly winds.

Aspect: NA

Slope angle: NA

Profile: NA

Surface patterns: NA

Position: NA

Physiographic site type of natural area: Walker's Mill Pond Natural Area

Physiographic site type of community cover type or community type: Swamp forest within Walker's Mill Pond Natural Area

Geologic formation: Flanner Beach Formation (Mixon and Pilkey 1976)

Geologic formation age: Pleistocene

References:

B. Natural Characteristics Summary

a. Vegetation-Biotic Community Summary

Community type: Fraxinus sp.-Nyssa sylvatica var. biflora-Taxodium distichum/ Acer rubrum
Community cover type:
Fraxinus sp.-Nyssa sylvatica var. biflora-Taxodium distichum
General habitat feature: Floodplain forest

Average tree height: 80'

Estimated age of canopy trees:100+

Estimated size of association (sq. meters, acres, etc.): 250 acres

Successional stage: Near climax?

Sere type: Psammopelosere

Common canopy species in community cover type or community type (but not dominant): Liriodendron tulipifera, Quercus michauxii, Quercus laurifolia

Common subcanopy-shrub stratum species in community cover type or community type (but not dominant): Carpinus caroliniana, Ilex opaca, Persea borbonia, Sabal minor

Common herb stratum species in community type (but not dominant): Carex spp., Rhynchospora miliacea, Saururus cernuus

Successional stage:

Sere type:

b. Soil Summary

Source of information: USDA-SCS. 1979. Soil Survey of Carteret County, NC. Interim report.

Soil series: Johnston and Muckalee

Soil order: Johnston-- Inceptisol; Muckalee-- Entisol

pH class: strongly acid to circumneutral (5.1-7.3)

Moisture class: wet to wet-mesic

Associated community cover type or community type:

c. Hydrology Summary

Drainage basin: Newport River

Hydrologic system: Palustrine

Hydrologic subsystem: Interaqueous

Water chemistry: Fresh, acidic (pH unknown)

Water regime: Intermittently flooded

d. Summary-Topography and Physiography

Topographic site type characteristics:

Land form: Floodplain

Shelter: Sheltered

Aspect: NA

Slope angle: Nearly level

Profile: NA

Surface patterns: Flats and pans

Position: Entire cross section of floodplain

Physiographic site type of natural area:
Walker's Mill Pond Natural Area
Physiographic site type of community cover type or community type: Floodplain forest within Walker's Mill Pond Natural Area
Geologic formation: Flanner Beach Formation (Mixon and Pilkey 1976)
Geologic formation age: Pleistocene

References:

c. Natural Characteristics Summary

a. Vegetation-Biotic Community Summary

Community type: Varies. Examples are Carya glabra-Quercus nigra/Cornus florida/Polystichum acrostichoides and C.glabra-Q.
Community cover type: michauxii/Cornus florida/Lyonia lucida
Varies. Carya glabra-Quercus nigra and C.glabra-Q.michauxii are
General habitat feature: frequent.
Mesic hardwood forest
Average tree height: 80'

Estimated age of canopy trees: 100+?

Estimated size of association (sq. meters, acres, etc.):
Less than 25 acres

Successional stage: Mostly near climax. Mixed transient and climax at some sites due to selective cutting about 1900.
Sere type: Psammosere

Common canopy species in community cover type or community type (but not dominant): Quercus alba, Quercus falcata, Pinus taeda (locally), Pinus palustris (locally)
Common subcanopy-shrub stratum species in community cover type or community type (but not dominant): Ilex opaca, Leucothoe axillaris, Symplocos tinctoria, Stewartia malacodendron
Common herb stratum species in community type (but not dominant): Panicum sp., Mitchella repens

Successional stage:

Sere type:

b. Soil Summary

Source of information: USDA-SCS. 1979. Soil Survey of Carteret County, NC. Interim report.

Soil series: Onslow loamy sand and Lynchburg fine sandy loam

Soil order: both Ultisol

pH class: extremely acid to acid (3.6-5.5)

Moisture class: mesic

Associated community cover type or community type:

c. Hydrology Summary

Drainage basin: Newport River

Hydrologic system: Mesic

Hydrologic subsystem: Mesic to dry-mesic

Water chemistry: Fresh

Water regime: Permanently exposed

d. Summary-Topography and Physiography

Topographic site type characteristics:

Land form: Slope and narrow fringe of adjacent upland.

Shelter: Sheltered

Aspect: Most slope areas face easterly or westerly.

Slope angle: Nearly level (0-2) to gently sloping (2-6); rarely sloping (6-10)

Profile: Convex, concave, and constant

Surface pattern: Mostly smooth

Position: Entire slope and fringe of adjacent upland

Physiographic site type of natural area:
Walker's Mill Pond Natural Area
Physiographic site type of community cover type or community type: Slopes and adjacent upland fringes within Walker's Mill Pond Natural Area
Geologic formation: Flanner Beach Formation (Mixon and Pilkey 1976)
Geologic formation age: Pleistocene

References: Mixon,R. and O.Pilkey. 1976. Reconnaissance Geology of the Submerged and Emerged Coastal Plain Province, Cape Lookout Area, North Carolina. US Geol. Survey Prof. Paper 859. US Govt. Print. Office, Washington.

e. Summary- Endangered and threatened species

Name of species: Habernaria flava

Species legal status: Threatened peripheral

Number of populations on site: Several

Number of individuals per population: "Scores"

Size and maturity of individuals: Flowering and fruiting

General vigor of population: Apparently good

Disturbance or threats to population: None

Habitat characteristics

Vegetation association: Fraxinus sp.-Nyssa sylvatica var. biflora- Taxodium distichum/ Acer rubrum

Name of species: American alligator

Species legal status: Endangered (Federal list)

Number of populations on site: Unknown

Number of individuals per population: Unknown

Size or maturity of individuals: Unknown

Comments: Individuals have been released at the mill pond during the last decade, but the species was probably present before, as it occurs on the adjacent Newport River.

Name of species: Anhinga

Species legal status: Threatened

Number of populations on site: One?

Number of individuals per population: Ca. 6 or more

Size or maturity of individuals: Adults present

General vigor of population: Unknown

Disturbance or threats to population: Probably none

Comments: This species, which is very rare in Carteret County, has been present each spring from 1976 through 1980. Nesting is likely somewhere in the swamp forests or floodplain areas. If the species does nest here, this may be the northeasternmost nesting locality in the U.S.

Name of species: Turkey vulture

Species legal status: Threatened

Number of populations on site: Unknown

Number of individuals per population: Unknown

Size or maturity of individuals: Adults present

Comments: This species is permanent resident here. It has apparently increased in population in the last five years. It may breed in or adjacent to the natural area.

Name of species: Black vulture

Species legal status: Special Concern

Number of populations on site: Unknown

Number of individuals per population: Unknown

Size or maturity of individuals: Adults present

Comments: This species is permanent resident here. It has apparently increased in population in the last five years. It may breed in or adjacent to the natural area.

Name of species: Cooper's hawk

Species legal status: Special Concern

Comments: This species is very rare or absent as a breeding species in Carteret County. An individual was seen here in late April 1980, raising the possibility of breeding here.

Name of species: Red-shouldered hawk

Species legal status: Special Concern

Number of populations on site: At least 4-5 (one per floodplain)

Number of individuals: Approx. 3

Size or maturity of individuals: Adults present

General vigor of population: Numbers constant for last 10 years

Disturbance or threats to population: None

Habitat characteristics

Vegetation association: Floodplain forest

f. Species lists

PLANTS-

Trees:

Acer rubrum
Carpinus caroliniana
Carya glabra
Cornus florida
Fraxinus sp. (tomentosa?)
Ilex opaca
Liquidambar styraciflua
Liriodendron tulipifera
Magnolia virginiana
Morus rubra
Nyssa sylvatica var. biflora
Nyssa sylvatica var. sylvatica
Osmanthus americana
Persea borbonia
Pinus palustris
Pinus taeda
Prunus nigra
Quercus alba
Quercus falcata
Quercus laurifolia
Quercus michauxii
Quercus nigra
Salix nigra
Taxodium distichum
Ulmus americana

Shrubs:

Alnus serrulata
Aralia spinosa
Callicarpa americana
Cephalanthus occidentalis
Cornus stricta
Cyrilla racemiflora
Euonymus americanus
Gaylussacia frondosa
Hypericum sp.
Itea virginica
Leucothoe axillaris
Lyonia lucida
Myrica cerifera
Sabal minor
Stewartia malacodendron
Symplocos tinctoria
Vaccinium atrococcum
Viburnum nudum

Herbs:

Arisaema triphyllum
Asclepias variegata
Bartonia paniculata
Boehmeria cylindrica
Burmannia biflora
Centella asiatica
Chimaphila maculata
Drosera intermedia
Eriocaulon decangulare
Galium sp.
Habernaria flava
Hydrocotyle umbellata
Hydrocotyle verticillata
Iris virginica
Lobelia cardinalis
Ludwigia palustris
Ludwigia sp.
Mitchella repens
Monotropa uniflora
Pluchea foetida
Polygala lutea
Polygonum spp.
Pontederia cordata
Proserpinaca palustris

Herbs (continued):

Sabatia calycina
Sagittaria graminea
Saururus cernuus
Sparganium americanum
Utricularia juncea
Viola papilionacea
Xyris sp.

Aquatics:

Egeria densa
Nymphaea odorata
Nymphoides aquatica

Graminoids:

Arundinaria gigantea
Carex spp.
Cyperus spp.
Eleocharis sp.
Fuirena pumila
Panicum spp.
Rhynchospora miliacea
Scirpus cyperinus

Ferns:

Asplenium platyneuron
Athyrium asplenioides
Botrychium dissectum
Osmunda regalis
Polystichum acrostichoides
Thelypteris palustris
Woodwardia areolata
Woodwardia virginica

Vines:

Anisostichus capreolata
Campsis radicans
Decumaria barbara
Matelea suberosa
Mikania scandens
Parthenocissus quinquefolia
Rhus radicans
Rubus sp.
Smilax bona-nox
Smilax laurifolia
Vitis aestivalis
Vitis rotundifolia

Epiphytes:

Phoradendron serotinum
Tillandsia usneoides

ANIMALS-

Amphibians:

Southern toad
Southern cricket frog
Gray treefrog
Green treefrog
Spring peeper
Pine woods treefrog
Squirrel treefrog
Little grass frog
Bullfrog
Green frog
Southern leopard frog
Carpenter frog
Eastern narrowmouth toad

Reptiles:

American alligator
Snapping turtle
Eastern mud turtle
Yellowbelly slider
Eastern box turtle
Carolina anole
Southeastern five-lined skink
Ground skink
Eastern glass lizard
Black racer
Corn snake
Rat snake
Eastern kingsnake
Banded watersnake
Rough green snake
Eastern ribbon snake
Copperhead
Cottonmouth
Timber rattlesnake

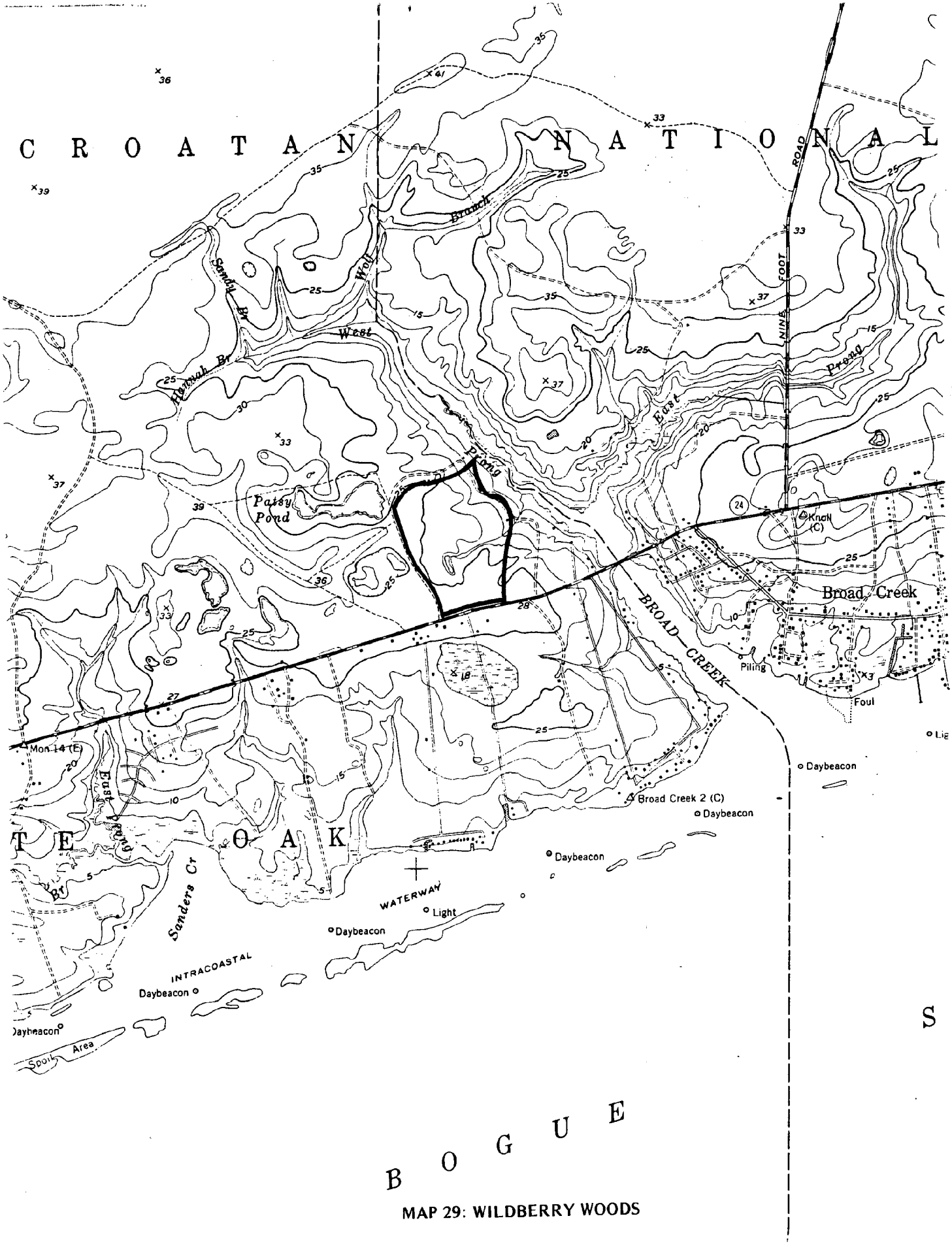
Birds (* = breeds or probably breeds within area):

Common loon
Pied-billed grebe
* Anhinga
* Great blue heron
* Green heron
Little blue heron
Great egret
Snowy egret
Yellow-crowned night heron
American bittern
White ibis
Mallard
Pintail
Green-winged teal
Blue-winged teal
American wigeon
* Wood duck
Ring-necked duck
Lesser scaup
Ruddy duck
Hooded merganser
Turkey vulture
Black vulture
Sharp-shinned hawk
Cooper's hawk
* Red-tailed hawk
* Red-shouldered hawk
Marsh hawk
* Osprey
Merlin
American kestrel
Bobwhite
American woodcock
Spotted sandpiper
Solitary sandpiper
Mourning dove

* Yellow-billed cuckoo
Black-billed cuckoo
* Screech owl
* Great horned owl
* Barred owl
* Chuck-will's-widow
* Ruby-throated hummingbird
Belted kingfisher
* Common flicker
* Pileated woodpecker
* Red-bellied woodpecker
Red-headed woodpecker
Yellow-bellied sapsucker
* Hairy woodpecker
* Downy woodpecker
Eastern kingbird
* Great crested flycatcher
Eastern phoebe
* Acadian flycatcher
Purple martin
* Blue jay
* Common crow
Fish crow
* Carolina chickadee
* Tufted titmouse
Red-breasted nuthatch
* Brown-headed nuthatch
Brown creeper
House wren
Winter wren
* Carolina wren
* Gray catbird
* Brown thrasher
American robin
* Wood thrush
Hermit thrush
* Blue-gray gnatcatcher
Golden-crowned kinglet
Ruby-crowned kinglet
Cedar waxwing
* White-eyed vireo
* Yellow-throated vireo
Solitary vireo
* Red-eyed vireo
* Black-and-white warbler
* Prothonotary warbler
* Swainson's warbler
* Worm-eating warbler
Orange-crowned warbler
* Northern parula
Black-throated blue warbler
Yellow-rumped warbler
* Black-throated green warbler
* Yellow-throated warbler
* Pine warbler
* Prairie warbler
* Ovenbird
Northern waterthrush
* Kentucky warbler
* Common yellowthroat
Yellow-breasted chat
* Hooded warbler
American redstart
Redwinged blackbird
Rusty blackbird
* Common grackle
* Brown-headed cowbird
Scarlet tanager
* Summer tanager
* Cardinal
Blue grosbeak
* Indigo bunting
Evening grosbeak
Purple finch
Pine siskin
American goldfinch
* Rufous-sided towhee
Dark-eyed junco
White-throated sparrow
Fox sparrow
Swamp sparrow
Song sparrow

Mammals:

Opossum
Eastern mole
Black bear
Raccoon
River otter
Eastern gray squirrel
Eastern cottontail
Whitetail deer



MAP 29: WILDBERRY WOODS

Wildberry Woods

Name of Natural Area: Wildberry Woods[1]

Location: Carteret County; Salter Path USGS Topographic quad map; on N.C. Hwy. 24 and Broad Creek southwest of Morehead City, North Carolina adjoining the Croatan National Forest. See Map 29.

Ownership and Administration: Dr. Jan Kohlmeyer is the owner.

Size: Approximately 38 acres, excluding residential area.

Land Use: The land has served as a study site for biologists from the University of North Carolina and other institutions. Some cutting of pine by the previous owners, occurred around 1962. The Kohlmeyer residence, a house and some outbuildings, adjoin the natural area. Since their ownership, the Kohlmeyers maintained this tract in its natural condition.

Protection Status: The land is protected as a registered N.C. Natural Heritage Area.

Reasons for Significance: Wildberry Woods is representative of coastal plain communities. Within its relatively small area, three principal communities are featured: the estuarine Spartina-Juncus salt-marsh community; the sandy woodlands, savannas of loblolly and longleaf pines; and the evergreen shrub bogs complemented by a freshwater pond and branches. The site offers habitat for several rare species (see Table 1). Osprey, a bird of special concern, fish regularly in Broad Creek, the northeast boundary of the proposed natural area. Moreover, orchids, the Venus Flytrap and pitcher plants populate portions of the land. Wildberry Woods exhibits a wide natural diversity on both the community and species level. The area serves as an excellent example of coastal plain communities, and its usefulness for nature interpretation and scientific observation is evident.

Preserve Recommendation: Wildberry Woods should be protected from development because of its value as habitat for the various special plants and animals, its function as a possible field station for educational purposes, and its proximity to the Patsy Pond natural area.

Management Recommendation: Management efforts should be directed towards simple maintenance and up-keep of the property with minimal development.

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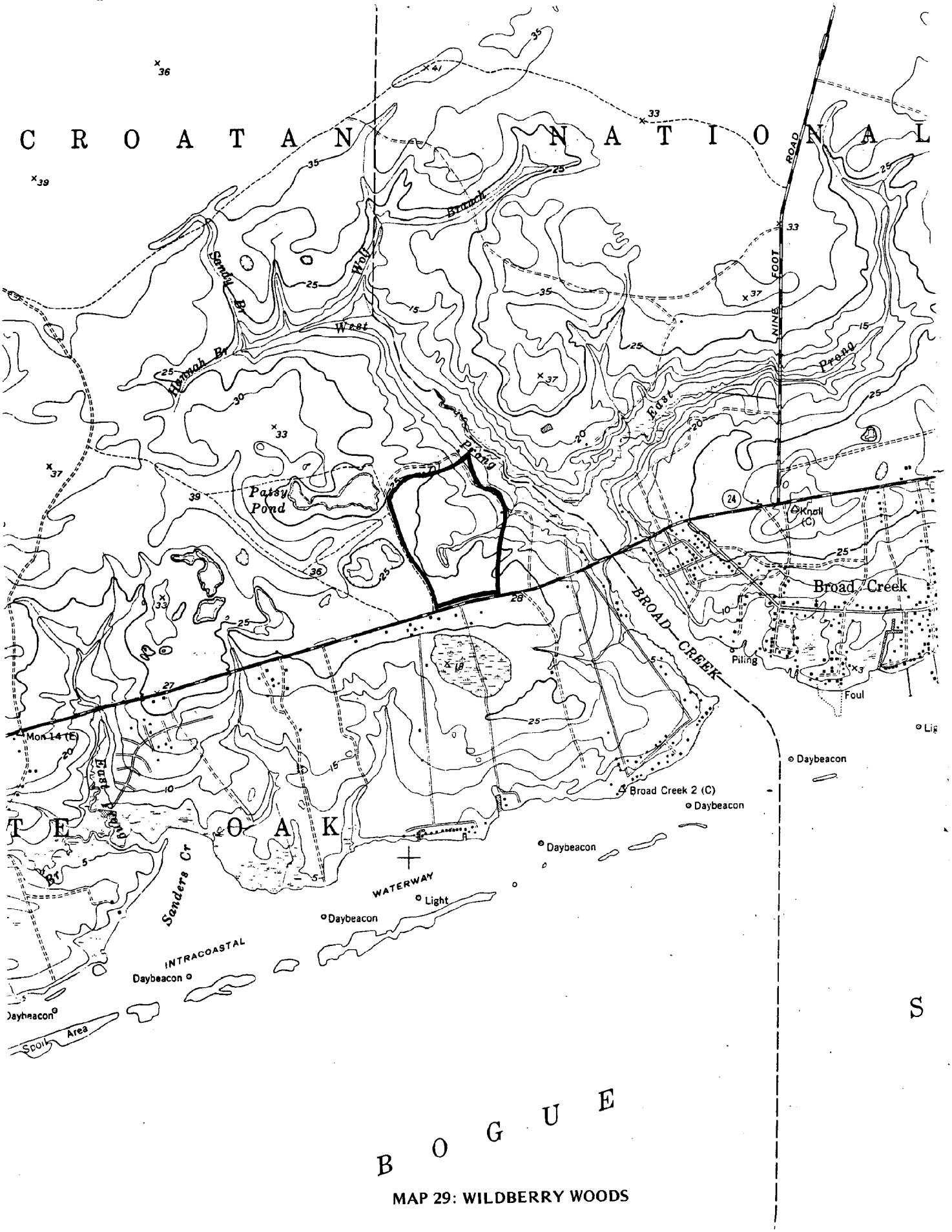
[1]Compiled by the Natural Heritage Program, DNRCD, Division of Parks and Recreation, Raleigh, N. C. (1979).



MAP 29: WILDBERRY WOODS

Data Sources: Dr. Jan Kohlmeyer, Institute of Marine Sciences, Morehead City, N. C.
Ms. Jeannie Wilson, Hampton Mariners Museum, Beaufort, N.C.
Dr. D. E. Hoss, National Marine Fisheries Service, Beaufort, N.C.
Dr. C. E. Jenner, Dept. of Zoology, University of North Carolina, Chapel Hill, N.C.

Scientific References: Kohlmeyer, J. (1977) New records of angiosperm and terrestrial fungi from Carteret County, North Carolina. Jour. Elisha Mitchell Sci. Soc. 92: 27-30.

Table 1a. Rare and Endangered Animals of Wildberry Woods

Scientific Name	Common Name	Status[2]	No. NC Sites	Habitat
Pandion haliaetus	Osprey	SC	64	Breeds near open water commonly in salt and fresh water.

Table 1b. Rare and Endangered Plants of Wildberry Woods

Scientific Name	Common Name	Status[2]	*No. NC Sites	Habitat
Dionaea muscipula	Venus' flytrap	TE	90	Wet, sandy ditches, savannahs and open bog margins.
Sarracenia rubra	Sweet pitcher plant	TT	52	Shrub bogs and savannahs.

* These plants are no longer listed as threatened or endangered by the N.C. Department of Agriculture's Plant Protection Program.

[2]Taken from Cooper, J. E., S. S. Robinson, and J. B. Funderberg (Eds.). 1977. Endangered and Threatened Platns and Animals of North Carolina. N. C. Museum of Natural History, Raleigh, N. C. 444 pages + i-xvi.

Explanation of Status Categories

Plants

EE - Endangered Endemic
ED - Endangered Disjunct
EP - Endangered Peripheral
ET - Endangered Throughout
TE - Threatened Endemic
TD - Threatened Disjunct
TP - Threatened Peripheral
TT - Threatened Throughout

Animals

E - Endangered
T - Threatened
SC - Special Concern
UD - Undetermiend

[3]Number of recorded occurrences of species in state known by the Natural Heritage Program as of July 1979.

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